고체산화물 연료전지용 예혼합 연소시스템 개발

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Development of Combustion System for Solid Oxide Fuel Cell System

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Solid oxide fuel cells(SOFCs) can convert the chemical energy of fuel into electricity directly. With the rising fuel prices and stricter emission requirement, SOFCs have been widely recognized as a promising technology in the near future. In this study, lean premixed flame using the orifice swirl burner was analyzed numerically and experimentally. We used the program CHEMKIN and the GRI 3.0 chemical reaction mechanism for the calculation of burning velocity and adiabatic flame temperature to investigate the effects of equivalence ratio on the adiabatic flame temperature and burning velocity respectively. Burning velocity of hydrogen was calculated by CHEMKIN simulation was 325cm/s, which was faster than that of methane having 42 cm/s at the same equivalence ratio. Also Ansys Fluent was used so as to analysis the performance with alteration of swirl structure and orifice mixer structure. This experimental study focused on stability and emission characteristics and the influence of swirl and orifice mixer in Solid Oxide Fuel Cell Systme burner. The results show that the stable blue flame with different equivalence ratio. NOx was measured below 20 ppm from equivalence ratios 0.72 to 0.84 and CO which is a very important emission index in combustor was observed below 160 ppm under the same equivalence region.

Key words : Solid oxide fuel cell(고체산화물 연료전지), Burning velocity(연소속도), Adiabatic flame temperature(단열화염온도), NOx(질소산화물), CO(일산화탄소)

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PEMFC 가습기 용 다공성 중공사막의 물전달 모델링

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Modeling of Water Transport in Porous Membrane for PEMFC Humidifer

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Water transport through the microporous membrane was modeled considering capillary condensation as well as capillary flow in porous media as a function of pore diameter and relative humidity at the surface. The present model was adopted by the numerical simulation of non-isothermal, non-homogenous flow in a shell and tube typed gas to gas membrane humidifier for PEMFC (proton exchange membrane fuel cell) and the result shows good agreement with experimental data.

Key words : Shell and tube humidifier (중공사형 가습기), PEMFC (고분자전해질 연료전지), Porous Membrane (다공성막), Capillary condensation (모세관 응축), Capillary Flow (모세관 유동)

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