

통합 수증기 개질 시스템의 작동 조건에 대한 수치적 연구

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Parametric Study of an Integrated Steam Methane Reformer with Top-Fired Combustor

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It is of great importance to predict operating parameter characteristics of an integrated fuel processor by the increased life-time and system performance. In this study, computational analysis is performed to gain fundamental insights on transport phenomena and chemical reactions in reformer which consists of preheating, steam reforming, and water gas shift reaction beds. Also, a top-fired burner locates inside of the reforming system. The combustor is providing thermal energy necessary for the steam reforming bed which is an endothermic catalytic reactor. Two-dimensional numerical model of the integrated fuel processing system is introduced for the analysis of heat and mass transport phenomena as well as surface kinetics and catalytic process. A kinetic model was developed and then computational results were compared with the experimental data available in the literature. Subsequently, parameter study using the validated steam methane reforming model was conducted by considering operating parameters, i.e. steam to carbon ratio and temperature.

Key words : Integrated Steam Reformer(통합 수증기 개질기), Water Gas Shift Reaction(수성가스 전이반응), Hydrogen Production (수소 생산), Computational Analysis (전산 해석)

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Optimization of Supported Pt Catalysts for Single Stage Water Gas Shift Reaction

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본 연구에서는 일단 수성가스전이반응 (Single stage water gas shift reaction)을 위해 높은 활성을 가진 백금 담지 촉매를 함침법 (Incipient wetness impregnation method)으로 제조하여 높은 공간 속도 (Gas hourly space velocity) $45,515\text{h}^{-1}$ 에서 담체에 따른 촉매 활성을 평가하였다. 담체는 CeO_2 , ZrO_2 , MgO , $\text{MgO-Al}_2\text{O}_3$ ($\text{MgO} = 30\text{ wt}\%$) 그리고 Al_2O_3 를 사용하였으며 백금의 담지량은 $1\text{ wt}\%$ 로 고정하였다. BET, XRD, TPR, CO-chemisorption 분석을 통하여 담체의 구조적 특성이 촉매 활성에 미치는 영향에 대하여 조사하였다.

Key words : Single stage water gas shift reaction (일단 수성가스전이반응), Incipient wetness impregnation method (함침법), Gas hourly space velocity (공간속도)

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