

Modeling of autothermal diesel reformer for SOFC-APU (Solid Oxide Fuel Cell – Auxiliary Power Unit) system

최수항, 장 홍, 김대욱, 배민석¹, 김동연¹, 배중면¹, 이재형[†]

KAIST 생명화학공학과; ¹KAIST 기계공학과

(jayhlee@kaist.ac.kr[†])

To supply power for heavy duty vehicle, SOFC-APU (Solid Oxide Fuel Cell-Auxiliary Power Unit) system contributes to achieve lower carbon dioxide emission than engine idling, by increasing the overall efficiency of fuel. For this purpose, the amount of reformat produced from diesel reformer should be estimated accurately since it is directly related to power produced from SOFC stack. In this study, modeling of autothermal diesel reformer is performed to estimate the amount of reformat, with known power-law kinetics of heterogeneous catalytic reaction on monolithic catalyst. 1-dimensional model is required for real-time calculation because of computational burden, but it has limitation that 1-dimensional model could not express radial gradient of state. To solve this problem, 2-dimensional cylindrical coordinate model, which can express radial distribution, is also studied to see the difference between 1-dimensional and 2-dimensional model. The information from 2-dimensional model is used to improve 1-dimensional model to reflect the information in the result from 1-dimensional model. Validation of the model is followed by comparing reformat concentration from experimental data with that from the result of improved model.