Kinetic and CFD Modeling of Exhaust Gas Reforming of Natural Gas in a Catalytic Fixed-Bed Reactor for Spark Ignition Engines

Abdulwahid Arman[1], Ftwi Yohaness Hagos[1,2,], Abdul Adam Abdullah[1,2], Abd Rashid Abd Aziz[3], Rizalman Mamat[1,2,] Chin Kui Cheng[4], Dai-Viet N. Vo[5]*

[1]Advanced Fluids Focus Group, Faculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia Pahang, Pekan, 26600, Pahang, Malaysia

[2]Automotive Engineering Centre, Universiti Malaysia Pahang, Pekan, 26600, Pahang, Malaysia

[3]Centre for Automotive Research and Electric Mobility, Universiti Teknologi PETRONAS, Seri Iskandar, 31750, Perak, Malaysia

[4]Faculty of Chemical & Natural Resources Engineering Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300, Gambang Kuantan, Pahang, Malaysia

[5]Center of Excellence for Green Energy and Environmental Nanomaterials (CE@GrEEN), Nguyen Tat Thanh University, 300A Nguyen Tat Thanh, District 4, Ho Chi Minh City 755414, Vietnam

*ftwi@ump.edu.my

ABSTRACT

Fuel reforming is an attractive method for performance enhancement of internal combustion engines fueled by natural gas, since the syngas can be generated inline from the reforming process. In this study, 1D and 2D steady-state modeling of exhaust gas reforming of natural gas in a catalytic fixed-bed reactor were conducted under different conditions. With increasing engine speed, methane conversion and hydrogen production increased. Similarly, increasing the fraction of recirculated exhaust gas resulted in higher consumption of methane and generation of H2 and CO. Steam addition enhanced methane conversion. However, when the amount of steam exceeded that of methane, less hydrogen was produced. Increasing the wall temperature increased the methane conversion and reduced the H2/CO ratio.

KEYWORDS: EGR, Exhaust gas reforming, Natural gas, SI engine, Syngas

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