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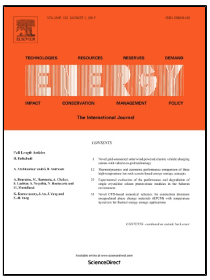

Enrichment of Hydrogenotrophic Methanogens by Means of Gas Recycle and Its Application in Biogas Upgrading

Yeo-Myeong Yun, Shihwu Sung, Seoktae Kang, Mi-Sun Kim, Dong-Hoon Kim

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Yeo-Myeong Yun[a,b], Shihwu Sung[a], Seoktae Kang[b], Mi-Sun Kim[c], Dong-Hoon Kim[d,*]

[a] College of Agriculture, Forestry and Natural Resource Management, University of Hawaii at Hilo, 200 W. Kawili Street, Hilo, HI, 96720, USA

[b] Department of Civil and Environmental Engineering, KAIST, 291 Daehak-ro, Yuseong-gu, Daejeon 305-701, South Korea

[c] Biomass and Waste Recycling Laboratory, Korea Institute of Energy Research, 102 Gajeong-ro, Yuseong-gu, Daejeon 305-343, South Korea

[d] Department of Civil Engineering, Inha University, 100 Inha-ro, Nam-gu, Incheon, South Korea

[*] Corresponding author: dhkim77@inha.ac.kr, Tel: +82-32-860-7562, Fax: +82-32-873-7560

Abstract

Biomethanation by hydrogenotrophic methanogens has been proven as a potential process for managing renewable power intermittency and upgrading biogas. The present work aimed to enrich hydrogenotrophic methanogens under different mixing conditions (gas recycle *vs.* mechanical mixing) and temperatures (mesophilic *vs.* thermophilic conditions) for biogas upgrading. The synthetic gas (H_2:CO_2=4:1) was fed to the reactor bottom at a hydrogen injection rate (HIR) of 1.6 L $H_2 \cdot L^{-1} \cdot d^{-1}$. The gas recycle (100 $L \cdot L^{-1} \cdot d^{-1}$) under thermophilic condition was found to be the most effective, reaching over 96% H_2 conversion to CH_4 within 15 d of operation. Archaea community analysis performed by 454 pyrosequencing showed