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A Study on the Direct Conversion and Hydrogen Production of Low Concentration Carbon Dioxide Emissions Using DARM

Hyo Sik Kim[1], Ji-Hyeon Kim[1], Suk-Hwan Kang[1†]
[1]Institute for Advanced Engineering
175-28, Goan-ro 51 beon-gil, Baegam-myen, Yongin-si, Gyeonggi-do, Republic of Korea
hyosgogo@iae.re.kr; shkang@iae.re.kr[†]

Extended Abstract

The climate change crisis has been warned by carious institutions and researchers around the world, and today, disasters caused by such climate change are occurring around the world. Therefore, countries around the world are making various efforts to solve this climate change crisis and reducing greenhouse gases is one of them.

CCU technology is a technology that converts carbon dioxide beyond the existing CCS and is highly interested as a key technology for reducing greenhouse gases.

DRM(Dry reforming of methane) technology can be used as CCU technology because it produces synthetic gases (CO, H_2) using greenhouse gases (CO_2, CH_4). However, conventional dry reforming of methane (DRM) includes a capture process to use the high concentration of CO_2 emitted from the process, resulting in additional CO_2 emissions, which requires a lot of energy. Besides, since DRM is a strong endothermic reaction, the temperature of the catalyst decreases during the reaction, causing problems such as coke generation, catalyst deactivation, and reactor blocking. If this problem is solved, the effect of reducing greenhouse gas can be maximized by extending DRM to the rear end of the power generation process through combustion of syngas using biomass. To solve the problem of DRM, this research developed a dry autothermal reforming process (DARM) that produces syngas by directly reacting CH_4 and CO_2 gas containing low concentrations of oxygen without a separate carbon capture unit. In addition, a study was conducted on the placement of catalysts in a fixed-layer reactor for efficient use of catalysts.

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