Optimal Design of an Integrated CO_2 Capture-Conversion Process: Combined Reforming of Methane based Methanol Production Utilizing CO_2 Captured via Adsorption at a Hydrogen Plant

노고산, 가성빈, 이재형†
KAIST
(jayhlee@kaist.ac.kr†)

The aim of this work is to design an optimal integrated CO_2 capture-conversion process. Since the feasibility of a CO_2 conversion process depends on how to obtain the necessary high purity CO_2 feedstock, it is essential to integrate a CO_2 capture plant with a CO_2 conversion plant and optimize it for improving its sustainability. In this work, CO_2 capture via the adsorption technology applied to a hydrogen plant is mainly considered. The captured CO_2 is fed into a methanol plant employing combined reforming of methane reaction. In order to argue the sustainability of the developed process, both CO_2 reduction feasibility and economic feasibility are discussed by evaluating a net CO_2 emission index (kg_{CO2}/t_{MeOH}) and methanol production cost ($/$t_{MeOH}$) and by comparing with those of a reference case, a non-CO_2 utilizing methanol plant. Additionally, an optimal purity of the captured CO_2 stream is searched to minimize the methanol production cost.