Energy-efficient single-loop mixed-refrigerant-based schemes for the liquefaction of synthetic natural gas

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Considering the current energy challenges, coal-enriched countries have focused on the green utilization of coal by converting it to a clean energy source, such as synthetic natural gas (SNG). To fulfill the global clean energy demand, liquefaction is a promising and feasible approach enabling safe storage and transportation. However, the liquefaction of SNG is an energy-and cost-intensive process, primarily owing to the presence of low-boiling impurities such as hydrogen and nitrogen. This paper describes the major challenges and issues associated with the SNG liquefaction process for its commercialization and attempts to solve the issues inherent to the SNG liquefaction industry. The optimal energy-efficient single-loop mixed-refrigerant-based liquefaction schemes, with the separation of low-boiling impurities (hydrogen and/or nitrogen), are presented as a major contribution of this study. This research was supported by the Basic Science Research Program Foundation of Korea(NRF) funded by the Ministry of Education (2018R1A2B6001566), the Priority Research Centers Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Education (2014R1A6A1031189)