

Innovative membrane process design for CO₂ capture from coal-fired power plants

이성훈, 윤석원, 김진국[†]

한양대학교

(jinkukkim@hanyang.ac.kr[†])

In this work, we proposed the novel membrane process design under cold temperature environment for CO₂ capture from coal-fired power plants. A increased CO₂/N₂ selectivity in the sub-ambient temperature is able to enhance the separation efficiency of the membrane module combined with the retentate gas sweeping system. In particular, the heat-integrated design with the external propane refrigeration system is employed to make the membrane module and CO₂ purification cold temperature at the same time. The objective function for optimization consist of main capital (membrane, compressor, and vacuum pump etc.) and operative (electricity) expenditures. The proposed novel membrane design, which is optimized by genetic algorithm, shows a 13 % reduction of CO₂ capture cost and a 16 % decrease of parasitic load compared to the conventional membrane structure.

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