

Conceptual design and feasibility study of hydrogen production from coal gasification coupled with Carbon capture

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The importance of hydrogen as an energy is increasing as the depletion of fossil fuels and environmental problems ever increase. Recently, government policies related to environmental pollution prevention have been announced, and therefore, the need for green hydrogen is getting more urgent. However, the commercialized technology for producing green hydrogen is still insufficient. To this end, this study presents conceptual design and techno-economic analysis of green hydrogen production from coal, which mainly consists of coal gasification from an eco-friendly as a raw material integrated gasification combined cycle (IGCC), water gas shift reaction, and carbon dioxide capture. The cost of each equipment was estimated based on the heat and mass balance from simulation and the economic feasibility of the entire process was analyzed. The optimum values of the main process variables were found by considering the plant economics through sensitivity analysis. As a result of the simulation, 20.7 tons of hydrogen were produced based on the 500MW IGCC process, which uses 200 tons of coal per hour as input, and more than 90% of the CO₂ generated at this time was captured.