

Process simulation and MATLAB linking optimization of blue ammonia synthesis including carbon capture and storage

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Ammonia used as fertilizer can be produced through the Harbor-Bosch method. The raw materials of the Harbor-Bosch method are hydrogen and nitrogen. Hydrogen source production methods include water electrolysis, SMR and biomass gasification. Nitrogen source production methods include membrane, PSA and cryogenic methods. The hydrogen source used the blue H₂ production method SMR-CCS method, and the nitrogen source used the cryogenic air separation unit method. In the SMR reaction, water and methane react to produce syngas. Thereafter, Syngas passes through the WGS reaction to produce hydrogen and CO₂. At this time, the generated CO₂ is a greenhouse gas and must be removed through an absorption process. Therefore, it is necessary to add a CCS process to the SMR method. In this way, blue ammonia has produced blue H₂. In this study, Aspen plus V11 was used to simulate blue ammonia process. With the aim of producing 50,000 Nm³/h hydrogen, the ratio of CH₄/AIR entering the furnace, the ratio of S/C injected into the SMR, and operating costs were optimized through MATLAB linking