

Economic and environmental potential assessment: Methanol steam reforming in a membrane reactor

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The Korean government has established CO₂ emission reduction target as well as significantly enhanced target for ratio of new and renewable energy (NRE) to total energy mix of 11% by 2035. Among 11 classified NRE, hydrogen (H₂) can be recognized as an ideal clean energy. As a typical method for worldwide H₂ production, the natural gas steam reforming accounts for about 48%; however, it is favored by high temperatures and high pressures due to its powerful endothermic nature. In this study, we propose methanol steam reforming in both a packed-bed reactor and a membrane reactor because it has several advantages such as low reaction temperature and high H/C ratio to produce sufficient hydrogen for H₂ refueling stations. Based on optimized chemical processes, techno-economic analysis has been carried out to investigate technical and economic feasibility and furthermore CO₂ emitted in the proposed model has been quantified by introducing current CO₂ tax credit in Korea to preliminarily assess environmental impact of it.