

Comparison of Formic Acid Production Processes with Respect to Economic and Environmental Perspectives

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Formic acid can easily decompose to hydrogen and carbon dioxide. Therefore, it receives attention from a candidate for chemical hydrogen storage and hydrogen carrier. Conventional formic acid production is mainly based on the methyl formate hydrolysis process which uses carbon monoxide and water as raw materials. And carbon monoxide generally comes from the steam reforming. This study dealt with several alternative processes for formic acid production. First, dry reforming is applied to another carbon monoxide production. And formic acid can be also synthesized by the CO₂ hydrogenation route which uses carbon dioxide and hydrogen. Conventional formic acid production processes with different carbon monoxide production methods were simulated with Aspen Plus. The purity of formic acid is 99 wt. % for the utilization of hydrogen carrier. And these two different feedstock routes were compared by techno-economic analysis and CO₂ life cycle assessment. Analyses are conducted based on the mass and energy balance of the simulation. Also, the CO₂-based process was evaluated for the economic and environmental aspects with the completion of modeling.