

Evaluation of CO₂ Mitigation by BTL Biofuels from Woody Biomass through Simulated Case Studies

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Abstract

In order to optimize the yield of biofuels and CO₂ mitigation, process design and simulation for our BLT (Biomass to Liquids) process were performed, and a case study was carried out. The process consisted of steam gasification of woody biomass, gas cleaning, compression, FT (Fischer-Tropsch) synthesis reaction, hydrogenolysis, and distillation. It was found that 21.3 kL/d of liquid hydrocarbons could be produced from 100 t/d of collected biomass by this process, and 34.1 t/d CO₂ mitigation was achieved. It was observed that the process that uses only biomass might not effectively achieve CO₂ mitigation. If the CO₂ emission factor of an external electricity source is lower and it is more efficient as compared to biomass-fired power generation, an external electricity source is recommended. The recycling of the offgas discharged from the FT reactor into the gasifier could increase the yield of liquid hydrocarbons. However, it could not improve the total extent of CO₂ mitigation because of the increase in the energy consumption of the process. In addition, recycling might make the process and/or the operation complex. In biofuel production, although the increase in the yield of liquid hydrocarbons is important, the actual degree of CO₂ mitigation achieved should be considered, and an effective process and operation should be developed accordingly.

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