Catalytic Upgrading of Thermochemically Produced Biocrude Oils to Hydrocarbon Fuels from Lab to Pilot Scale

Dong Jin Suh^{*,1}, Jeong-Myeong Ha¹, Jungho Jae¹, Changho Oh² ¹Korea Institute of Science and Technology, Seoul 02792, Republic of Korea ²Daekyung ESCO, Incheon 21984, Republic of Korea *E-mail: djsuh@kist.re.kr

Biofuels are promising sustainable energy to replace current hydrocarbon fuels without significant modification of current fuel utilization systems. Oxygenate fuels including bioalcohols and biodiesels are already commercialized because of their easy production methods. Although these fuels are widely used with the help of legal regulations, the use of these fuels is significantly limited because of their edible feedstocks including sugars and lipids and their poor fuel properties. Hence non-edible lignocellulosic biomass such as wood and grass has attracted much interest in recent years.

In order to obtain the biomass-derived hydrocarbon fuels, the processes of thermolysis and upgrading must be developed along with the development of appropriate separation processes. For the thermolysis processes, pyrolysis and hydrothermal liquefaction are frequently suggested to produce biocrude oils from biomass. The produced biocrude oils exhibit high viscosity, high acidity, and low energy density, which are caused by their high oxygen content. Therefore, the upgrading of biocrude oils to petroleum-like hydrocarbon fuels is required. Highly active and stable catalysts along with the efficient processes should be develop for the upgrading.

The thermolysis processes of biomass are investigated in this study. Fast pyrolysis and hydrothermal/solvothermal liquefaction are discussed [1,2]. The challenges for scaling up thermolysis processes are discussed and the possible solutions are suggested. The operation of pilot-scale fast pyrolysis system is described and its future development is discussed. Design and operation of scaled-up hydrothermal/solvothermal processes are also discussed [3,4].

For upgrading of biocrude oils, the development of active catalysts is performed and the optimum sets of catalysts for hydrotreating and hydrodeoxygenation are suggested [5-11]. The developed catalysts exhibited the required catalytic activity for the upgrading of both small molecule

model compounds and actual biocrude oils. The operation of pilot-scale upgrading of biocrude oils is also discussed.

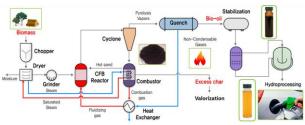


Fig. 1. Production of hydrocarbon fuels from biomass

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