

Thermochemical Conversion of Biomass Wastes into Bioenergy and Bioproducts

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Biomass has recently created attention as an alternative energy source to replace the use of fossil fuels and compensate for increasing energy consumption. Among many biomass conversion technology, a fluidized bed gasification as a thermochemical process was investigated using lab-, bench-, and pilot- scale gasifiers. Various approaches were applied to reduce the defects of biomass for better gasification performance; enriched-air and pressurized gasification, ash fusion prediction, and equilibrium modelling. With an optimized condition, syngas from a low calorie biomass waste was successfully fed into an engine power generator. Furthermore, catalytic gasification, steam gasification and chemical looping dry reforming were studied to increase the selectivity of hydrogen gas. Besides the gasification process, pyrolysis and torrefaction were also investigated to obtain liquid fuel and solid biochar. The biooil after catalytic upgrading and biochar after chemical activation showed promising properties for many applications in the biomass waste industries. The projects were expected to contribute to the local industries that produce the organic wastes uniformly and continuously.