

## Pyrolysis of Switch grass for Bio-Oil Production

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The production of biomass-derived biofuels such as switchgrass (*Panicum virgatum*) is vital given the current problems stemming from our use of fossil fuels. Fermentation-based alcohol biofuels such as ethanol have been extensively considered, but they suffer from high cost, limited scalability, and incompatibility with the existing hydrocarbon-based infrastructure. Fast pyrolysis is a thermochemical conversion process that uses heat in the absence of oxygen to transform solid biomass into liquid, solid and gaseous products. The liquid, known as bio-oil is a corrosive liquid composed of a complex mixture of hundreds of oxygenated organic compounds, produced from decomposed of the biomass components hemicellulose, cellulose and lignin. Bio-oil can be further upgraded into hydrocarbon fuels that are compatible with the existing petroleum-based infrastructure. In order to increase the amount of hydrocarbon molecules produced, a zeolite catalyst may be used. ZSM-5 removes the acids and other unstable compounds from pyrolysis products to produce more hydrocarbons. Pyrolysis of switchgrass in the presence of ZSM-5 produced hydrocarbons such as benzene, toluene, ethylbenzene and xylenes which are important petrochemicals. ZSM-5 also reduced the amounts of char produced during fast pyrolysis by 10 percent. Pyrolysis of switchgrass was tested in a pilot-scale screw conveyor pyrolysis reactor. The bio-oil yield for switchgrass was 60% with a char yield between 16-20%. The bio-oil produced using the pyrolysis reactor contained the same compounds found during analytical pyrolysis-GC/MS for switchgrass. Therefore, it is hypothesized that the same hydrocarbon compounds found in the pyrolysis GC/MS will be found in the pyrolysis reactor products.

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