Biomass Program

Thermochemical R&D

Gasification of Biorefinery Residues

Thermochemical processes offer the potential to convert lignin-rich residues and other residue streams from sugar biorefineries into value-added power, fuels, and products and greatly improve the economics of integrated biorefineries. Technoeconomic analyses of both stand-alone and integrated thermochemical processes have identified removal/reforming of tars and other syngas contaminants as the major opportunity for lowering the cost of clean syngas.

This project is addressing syngas clean-up by developing a better understanding of the chemical mechanisms and kinetics of trace product formation in biomass gasification.

R&D Pathway

Researchers are studying the fundamental mechanisms and reaction kinetics of trace product formation such as tar formation and destruction, transformation of sulfur, nitrogen, and chloride, and alkali metal release. This project is working in conjunction with the Feed Processing and Handling project and will use lignin materials representative of the residue streams from sugar biorefinery processes as the gasification feedstock.

Using previously developed laboratory-scale, Laminar Entrained Flow Reactors (LEFR) with Molecular Beam Mass Spectroscopy (MBMS), researchers will investigate the formation and conversion of model tar compounds as a function of temperature and gasification atmosphere (steam and partial oxidation). Tar compounds to be studied include benzene, naphthalene, phenol, and toluene.

Benefits

- **Development of cleaner, more efficient gasification technologies that are applicable to a wide variety of biomass feedstocks**

Applications

Advanced gasification technologies can be used in stand-alone facilities or integrated into sugar biorefineries, boosting the economics of the integrated biorefineries.

Project Participants

National Renewable Energy Laboratory

Project Period

FY 2003 – FY 2006

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