NREL National Renewable Energy Laboratory
Innovation for Our Energy Future

Thermochemical Conversion Research and Development

Pacific Northwest NATIONAL LABORATORY
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Gasification

Gasification entails heating biomass and results in a mixture of carbon monoxide and hydrogen, known as syngas.

Syngas Production

- Improve feedstock processing and handling for optimal conversion yields
- Investigate syngas composition as a function of feedstock and process conditions using spectrometry techniques
- Model and optimize integrated gasification processes
- Perform computational fluid dynamics modeling
- Identify tar formation pathways and link biomass structure with tar formation
- Develop catalytic hydrothermal gasification processes

NREL/PIX15697


NREL/PIX16029

Syngas Cleanup

- Develop and understand catalyst and sorbent performance to clean and condition biomass-derived syngas
- Collaborate with industry to develop and test emerging materials
- Develop a database of materials performance using raw syngas
- Rapidly screen catalysts for reforming, deactivation, and regeneration activity
- Demonstrate integrated biomass gasification, gas cleanup, and biofuels synthesis with real syngas at the pilot scale

Fuels Synthesis

- Develop and demonstrate a mixed alcohol synthesis (MAS) catalyst through a Cooperative Research and Development Agreement with NREL, PNNL, and Dow
- Improve catalyst selectivity and productivity and demonstrate performance under realistic operating conditions
- Use computational catalysis as a predictive tool to design more efficient catalysts


NREL/PIX12681


NREL/PIX15702

Pyrolysis

Pyrolysis, which is heating biomass in the absence of oxygen, produces liquid bio-oil.

Bio-oil Production

- Improve fast pyrolysis and catalytic pyrolysis methods at the micro, laboratory, and pilot scales
- Develop a process for hydrothermal liquefaction of agricultural and biorefinery residues
- Determine how bio-oil composition and process conditions affect conversion to transportation fuels


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Upgrading and Stabilization of Bio-oil

- Stabilize fast pyrolysis oils for further processing
- Perform bench-scale hydroprocessing to evaluate catalysts and operating parameters
- Upgrade bio-oil to a petroleum refinery feedstock in a cost-effective manner


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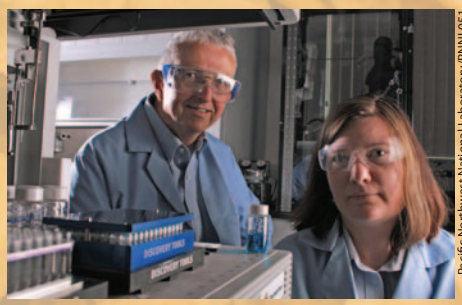
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Fuel Finishing

- Refine pyrolysis oil to gasoline, diesel, and jet fuel
- Develop standards for bio-oil utilization and applications
- Perform technoeconomic analyses of pyrolysis processes

Contacts

PNNL:
John Holladay
john.holladay@pnl.gov
509-375-2025

NREL:
Robert Baldwin
robert.baldwin@nrel.gov
303-384-6855

This work is supported by the U.S. Department of Energy Office of the Biomass Program.

Pacific Northwest National Laboratory
902 Battelle Boulevard, Richland, Washington 99352
1-888-375-7665 • www.pnl.gov

PNNL is operated by Battelle for the U.S. Department of Energy

National Renewable Energy Laboratory
1617 Cole Boulevard, Golden, Colorado 80401-3305
303-275-3000 • www.nrel.gov

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

NREL/FS-510-46664 • September 2009

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