



Biomass Program

Syngas Clean-Up and Conditioning

Syngas clean-up and conditioning is a key technical barrier to the commercialization of biomass gasification technologies and has the greatest impact on the cost of clean syngas. Currently, tar reforming catalysts have not demonstrated that they can clean and condition raw syngas to meet the strict quality standards for downstream fuel or chemical synthesis catalysts. The goal of this project is the successful implementation of fluidizable catalysts for tar reforming in a regenerating catalyst reactor.

R&D Pathway

Researchers are performing fundamental catalyst studies, surface analysis, and integrated catalyst studies to determine catalyst properties, such as catalyst deactivation kinetics and reaction rates, and to evaluate catalyst performance in the steam reforming of tars produced during gasification of biorefinery residues.

Micro-activity test system (MATS) units are used in the fundamental studies to determine catalyst properties. Past results have illustrated that catalyst reduction behavior is critical to understanding how the active catalyst surface forms. Catalyst reduction behavior provides a fingerprint of the active surface and can be used to follow

changes in catalyst activity during reforming.

Using a pilot-scale fluidized bed tar reforming reactor in NREL's Thermochemical Process Development Unit (TCPDU), the performance of three fluidizable tar reforming catalysts with wood- and corn stover-derived syngas was evaluated. The negative impact of sulfur in stover-derived syngas on initial catalyst deactivation was highlighted and as a result, on-line sulfur analysis was implemented in the TCPDU.

Researchers will continue surface analysis and fundamental screening studies to assess the impact of sulfur released from biorefinery residue gasification on the long-term activity and regenerability of the tar reforming catalysts. These catalysts will be validated by demonstrating the production of mixed alcohols from stover-derived syngas (see Mixed Alcohols Production from Syngas project).



NREL's bench-scale catalyst microactivity test system.

Thermochemical R&D

Benefits

- **Improved performance of gas cleanup systems**

Applications

New catalyst systems for syngas cleanup will improve the overall economics of biomass gasification technologies.

Project Partners

**National Renewable Energy Laboratory (NREL)
Pacific Northwest National Laboratory (PNNL)**

Project Period

FY 2001 – FY 2007

For more information contact:

**David Dayton
National Renewable Energy
Laboratory
David_Dayton@nrel.gov**

**EERE Information Center
1-877-EERE-INF (1-877-337-3463)
www.eere.energy.gov**

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