Biomass Program

Bioproducts R&D

Catalytic Upgrading of Glycerol to Propylene Glycol

Biodiesel, a clean-burning alternative fuel, is produced through transesterification of vegetable oils. This process also generates glycerol, the value of which can affect the biodiesel facility's profitability. Although there is a large market for biodiesel, increasing biodiesel production to meet demand could lead to an oversupply of glycerol and depress glycerol prices. As a result, there is interest in developing processes to convert glycerol to higher-value products.

This project is developing enabling technologies that will lead to an integrated process for the production of propylene glycol (PG) from glycerol. PG is currently fossil-based and is used in a wide variety of applications, including detergents, food, paints, functional fluids (antifreeze, deicers), and polymers.

R&D Pathway

The project is composed of four tasks and research will progress from small (30 milliliter) flow reactors (Task 1) to larger systems (200-300 milliliter in Task 2 and 1 liter pilot in Task 3).

Task 1 involves catalyst optimization, validation and development of process economics. Catalyst properties such as composition, activation, and stability, as well as the effect of feed impurities on catalyst performance will be determined. The economic studies will be used to set technical targets for the process.

In Task 2, the catalysts will be evaluated in larger reactor systems and improvements to catalysts and processing conditions will be made. Separation strategies for PG recovery will be explored and the PG product quality will be evaluated. Economic analysis of the integrated process will be performed.

In Task 3, selected catalysts from Task 2 will be tested at the pilot scale. A conceptual design for a commercial unit will be developed in Task 4.

New technology will enable the production of biodiesel and propylene glycol, a high-value chemical, from oilseeds such as soybeans.

Benefits

- **Expand the market for glycerol from biodiesel production**
- **Displace fossil-based PG production**
- **Boost profitability of biodiesel production**

Applications

This technology could lead to an expanded U.S. biodiesel industry and increased displacement of fossil feedstocks via biodiesel and biobased PG production.

Project Participants

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Project Period

FY 2005 – FY 2008

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