

Bio-Based Process for Dicyclopentadiene



OVERVIEW

Bio-based dicyclopentadiene (DCPD) is being developed for chemical supply companies interested in alternative and reliable sourcing of high-purity DCPD at an affordable price point. Los Alamos is creating a sustainable and cost effective method for producing bio-based DCPD. This benefits chemical supply companies seeking an affordable source of high-purity DCPD for pesticides and resin production. The process utilizes renewable biomass and generates valuable intermediate products for the production of pesticides and resins, setting it apart from conventional petrochemical methods.

The technology is a multi-step chemical synthesis for converting furfural, which can be produced from corn bran or fiber, into ultrapure DCPD suitable for polydicyclopentadiene (pDCPD) production as well as other high-demand polymers. Sufficient corn bran and fiber are available in the United States to meet growing world-wide demand, ensuring DCPD consumers a reliable supply.

The global DCPD market is continuing to grow due to increased demand for polymer production, flame retardants, pesticides and other intermediates. Current DCPD processes are based on refining of pyrolysis gasoline where supply and price are affected by an unstable olefins industry. A bio-based process could provide a dependable supply of DCPD at a stable price and supply the struggling ethanol industry with a new, high-value product.

APPLICATION AREA

Sector: *Biotechnology and Bioscience*

Area: *Biochemistry*

Industry: *Chemical suppliers*

Market: *Dicyclopentadiene (DCPD)*

PARTNERSHIP OPPORTUNITIES

We are seeking a DCPD or ethanol producing industrial partner interested in scale-up of our bio-based DCPD process as a sustainable alternative. This technology is available for:

- ✓ Cooperative Agreement
- ✓ License

CONTACT

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TECHNOLOGY READINESS LEVEL: 4

Process and Component Validation

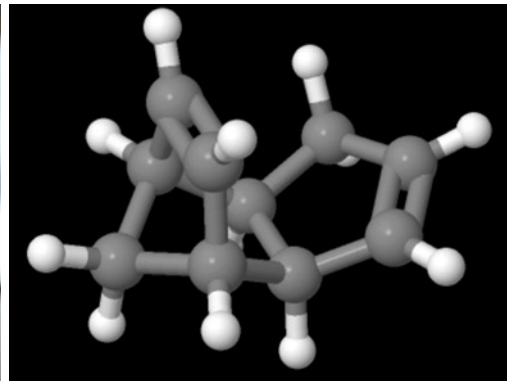
IP information

U.S. Pat. No. 11,306,039

U.S. Pat. No. 11,565,983

ADVANTAGES

- ✓ Utilizes agricultural byproducts that are readily available.
- ✓ Produces ultrapure DCPD suitable for pDCPD production.
- ✓ Dependable, sustainable source
- ✓ Cost-competitive and stable price
- ✓ High value byproducts



TECHNOLOGY DESCRIPTION

The current source of DCPD is pyrolysis gasoline byproduct from an ethylene plant. While Los Alamos researchers were seeking a bio-based source for fuel, a process was developed for converting furfural (a compound derived from cellulosic biomass) into ultrapure DCPD suitable for pDCPD production. Cyclopentanone, cyclopentanol and cyclopentene are intermediates in the process as well as other valuable products.

MARKET APPLICATIONS

A techno-economic analysis shows that bio-based DCPD can be competitively produced. DCPD is mainly used in polymer production, like hydrocarbon resins, polyester resins, and elastomers. The current goal is decreasing pyrolysis gasoline supply, and the push for renewable polymers will boost bio-based DCPD demand. Market drivers for DCPD are due to growing demand for pesticides and flame retardants end-products. Notable intermediate byproducts include cyclopentanone and cyclopentanol used in flavors and fragrances and cyclopentene for specialty chemical production.

NEXT STEPS

All reaction steps of the bio-based process have been demonstrated in the laboratory and through conceptual design. The next step is to demonstrate continuous operation of each step at the kilogram scale. Los Alamos is seeking partnership with companies interested in scale up of our process for evaluation of product quality for production at scale.