Mild, Nontoxic Production of Fuels and Chemicals from Biomass

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WARF: P110055US02

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method to produce strong yields of HMF, furfural and fructose from cellulose using boronic acids.

Overview

Fossil fuel resources supply almost 90 percent of the world's energy and the vast majority of its organic chemicals. This dependency is insupportable in light of rising emissions, demand and diminishing access.

Abundant, renewable biomass is an emerging alternative. But if biomass is to supplant oil, coal and gas as an energy and chemical resource, it must match the wide array of products derived from those traditional sources. In addition to liquid fuel, vital products like acids, aldehydes, alcohols and common polyester building blocks all can be produced from a biomass-derived molecule called HMF (5-hydroxymethylfurfural).

Before HMF can be transformed into useful products, it needs to be obtained and dehydrated from the biomass sugars. This process requires toxic heavy-metal catalysts or fragile enzymes to achieve practical yields. A new conversion approach that is efficient, selective and environmentally sound must be available before biomass can become a viable feedstock.

The Invention

UW–Madison researchers have developed methods for producing furans, including HMF and furfural, from biomass carbohydrates using boronic acids that enhance conversion.

Generating furans from cellulose, lignocellulosic biomass or other sugars is catalyzed by a 2-substituted phenylboronic acid alone or in combination with a metal salt. The reactants are mixed and heated at a selected temperature. The reaction may be carried out in a suitable solvent other than an ionic liquid, with water optionally added to increase yield.

Applications

- Biofuel production
- Transforming biomass, including lignocellulosic biomass, into useful chemicals and fuels
- Fructose production

Key Benefits

- Maximizes yields
- Minimizes undesired side-products
- Mild, one-pot reaction
- No use of toxic metal catalysts or fragile enzymes

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Additional Information

Related Technologies

- WARF reference number P08210US describes a method for converting sugars, starches and cellulosic biomass into furans using *N*,*N*-dimethylacetamide-lithium chloride (DMA–LiCl) as a solvent.

Tech Fields

- Clean Technology : Biobased & renewable chemicals & fuels

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854

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