Improved Method for Converting Biomass into Levulinic Acid for Renewable Fuel Sources

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method that maximizes the production of levulinic acid from biomass that can be used as a renewable fuel source.

OVERVIEW

Increasing crude oil prices and concerns with sustainability have led to a growing interest in producing chemicals and fuels from renewable sources. A major focus for the replacement of petroleum feedstock is biomass, particularly lignocellulosic biomass; this type of biomass has the potential to provide sustainable sugar streams from a variety of high-volume materials including agricultural and forest residuals and also high-yielding bioenergy crops.

One option for the conversion of lignocellulosic biomass into renewable fuel is the production of levulinic acid, which is a versatile platform chemical. However, current methods of levulinic acid synthesis often result in large amounts of side products and intractable materials or require expensive feedstock. Using these conventional methods, the actual yield of levulinic acid from biomass rarely exceeds 66 percent and usually is much less. A method for maximizing the production of levulinic acid from biomass is needed.

THE INVENTION

A UW–Madison researcher has developed an improved method of producing levulinic acid from biomass. The method comprises a two-stage, acid-catalyzed treatment. First, at least a portion of the pentoses present in the biomass feedstock are separated from the hexose sugars under mild acidic conditions to result in a biphasic sugar mixture consisting of a pentose-rich liquor and a hexose-rich solid. Then the pentose-reduced, hexose-rich biomass fraction is treated to yield levulinic acid. Utilizing this two-stage process, a maximum levulinic acid molar yield of about 66 percent based on the hexose content was obtained under optimized conditions. The method also may comprise separating the first aqueous acidic solution from hexose-rich solid so the pentoses in the solution can be converted into furfural or other compounds.

THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.

APPLICATIONS

- Conversion of biomass to levulinic acid
- Production of a relatively pure pentose stream that can be converted into other compounds

KEY BENEFITS

- Improves levulinic acid yield by reducing the amount of furfural in the reaction mixture, which also reduces the amount of humins formed during levulinic acid production
- Levulinic acid can be further upgraded to fuels and commodity chemicals.

STAGE OF DEVELOPMENT

Maximum levulinic acid yield was 66 percent, which compares to 49 percent from a single stage, mixed sugar process. Results were obtained at high acid concentration, high temperature and low substrate consistency.

ADDITIONAL INFORMATION

Tech Fields
Clean Technology - Biofuels & renewable fuels
Clean Technology - Bio-based & renewable chemicals

CONTACT INFORMATION

For current licensing status, please contact Mark Staudt at mstaudt@warf.org or 608-960-9845.