Clean Technology

One-Step Process to Generate Lignin-Derived Aromatics from Raw Biomass

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a one-step, "lignin-first" method for generating lignin-derived aromatics from raw biomass.

Overview

Lignocellulosic biomass is a renewable energy source with great potential for generating value-added chemicals. One of the major components of biomass is lignin (15-25 percent). Due to its infamously complex structure, lignin is typically treated as waste and burned for its heat value.

Yet lignin is the largest renewable source of aromatic building blocks in nature, and has huge potential for generating valuable aromatic compounds for use in transportation fuels, bio-based polymer materials and other chemicals. In the past few decades, various lignin depolymerization strategies have been developed for this purpose.

Among the various strategies, oxidative depolymerization presents advantages in making aromatic compounds with oxygen-containing functional groups, but most are optimized for carbohydrate recovery. However, such processes result in low recovery and damage to the lignin structure. Strategies that enable efficient oxidative depolymerization of lignin in intact, untreated biomass are highly desirable.

The Invention

UW–Madison researchers have developed a one-step, "lignin-first" method for generating lignin-derived aromatics from raw biomass. The new approach uses transition metal-based heterogeneous catalysts under neutral pH conditions with O2 as the oxidant. Compared to traditional biomass deconstruction approaches, which first isolate lignin from the feedstock before further processing for recovery of sugars, the lignin-first method avoids the cumbersome and destructive lignin extraction process. While not optimized for sugar recovery, the carbohydrate residues are not degraded and remain intact for further processing.

Applications

- Biomass fractionation and the production of lignin-derived aromatic compounds

Key Benefits

- Results in >30 percent yield of selected aromatic compounds
- Catalysts can be reused for at least seven cycles with relatively high activity
- Use of acetone as an ecofriendly solvent significantly reduces operational costs
- Highly efficient
- Keeps carbohydrate residues intact for further use (e.g., in fermentation)

Additional Information

For More Information About the Inventors

- Shannon Stahl

Tech Fields

- Clean Technology : Biobased & renewable chemicals & fuels

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