Clean Technology

Two-Step Process Converts Lignin into Simple Aromatic Compounds

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WARF: P140205US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a selective, low-cost method to convert oxidized lignin or lignin-type materials into simple aromatic compounds.

Overview

Lignin is a major component of non-edible biomass. It is a cheap byproduct of pulp and biofuel production and is one of the few naturally occurring sources of valuable aromatic compounds. Converting lignin's complex biopolymer structure into simple organic chemicals has attracted major interest.

For example, the world's supply of artificial vanillin is produced by oxidizing spent sulfite liquor. However, this requires a chemical feedstock that arises from an expensive and polluting sulfite pulping process used in few mills today. Other production methods are hazardous, energy intensive or unsuitable on an industrial scale.

UW–Madison researchers previously developed a highly efficient method to oxidize lignin or lignin subunits (see WARF reference number P130104US01). This work represented the first step towards a greener, cheaper conversion strategy.

The Invention

Building on their work, the researchers have now developed a two-step process for selectively converting lignin and lignin-type material into low molecular weight aromatic compounds.

The lignin is first selectively oxidized via the previously described method, then reacted with an organic carboxylic acid, salt or ester (e.g., formic acid) for a time and temperature sufficient to cleave carbon-carbon or carbon-oxygen bonds. The process results in high yields of simple aromatic compounds.

Applications

- Conversion of lignin to valuable aromatic fine chemicals

Key Benefits

- Strong reactivity and selectivity
- No expensive catalysts
- Potential to be industrially scalable
- No harmful or difficult-to-handle reagents

Stage of Development

The new process has been used to produce a mixture of small aromatic compounds (including vanillin, syringic acid and HMF) from an aspen-derived lignin sample.

Additional Information

For More Information About the Inventors

- Shannon Stahl
- Joshua Coon

Related Technologies

- For more information about the researchers' method to oxidize lignin, see WARF reference number P130104US01.

Tech Fields

- Clean Technology : Energy storage, delivery & resource efficiencies
- Materials & Chemicals : Biochemicals & biomaterials

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