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Biomass-derived Dienes from Cyclic Ethers and Diols

IP Status: US Patent Issued; Patent No. 10,919,030

APPLICATIONS:

- Diene synthesis from biomass vs petroleum-based
- Butadiene synthesis
- Isoprene synthesis
- Elastomers
- Adhesives and sealants
- Tires
- Rubber products such as styrene butadiene rubber (SBR), polybutadiene rubber (PBR), nitrile rubber (NR) and polychloroprene (Neoprene)
- Acrylonitrile butadiene styrene (ABS) plastic

BENEFITS AND FEATURES:

- Biomass-derived precursor
- One-step dehydro-decyclization of THF to butadiene
- One-step dehydration of MBDO to isoprene
- High yields (up to 98%)
- Catalyst technology
- Does not use fermentation
- Better selectivity and yield

THF to Butadiene

A new process uses a novel catalyst to synthesize butadiene in high yields from biomass-derived tetrahydrofuran (THF). Butadiene is made by contacting THF (or a THF derivative or combination thereof) with a heterogeneous acid catalyst to yield a diene. This new P-based heterogeneous catalyst, which is highly efficient at converting furans to dienes, performs dehydro-decyclization of tetrahydrofuran (THF) at elevated temperatures and achieves conversion of THF to butadiene with selectivity approaching 98%.

Converting 3-methyltetrahydrofuran to Isoprene

A new process uses a novel catalyst to synthesize isoprene in high yields. Isoprene is made by contacting 3-methyltetrahydrofuran (3-MTHF) with a heterogeneous acid catalyst (other than alumina, or Al2O3). This catalytic process dehydrates MTHF to isoprene via several combinations of temperatures, pressures, and space velocities (reactant volumetric flow rate per volume of catalyst) and achieves selectivity of 3-MTHF to isoprene of up to 100%.

Higher Yields, Lower Costs

Butadiene and isoprene, while traditionally produced from petroleum, can also be produced from biomass. However, these production methods suffer from low overall yields or low conversion rates, which prevent them from being economically feasible. In addition,

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Category

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Engineering & Physical Sciences/Materials
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conventional catalysts cannot operate at high selectivity. These new catalysts achieves high selectivity to dienes and produce butadiene and isoprene from a biomass-derived precursor at a high yield. Using a less expensive precursor is not only economically viable, but economically competitive with current petroleum processes.

Phase of Development - Prototype

Researchers

Paul Dauenhauer, PhD
Associate Professor, Chemical Engineering and Materials Science
External Link (www.cems.umn.edu)
Michael Tsapatsis, PhD
Professor, Chemical Engineering and Materials Science
External Link (www.cems.umn.edu)

References

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