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Non-Confidential Description - PSU No. 3460
"One-Step Catalytic Transformation of Carbohydrates to Liquid Fuels"

Keywords:

Alternative Energy, Liquid Fuels, Low Temperature Conversion Process

Links:

Inventor Website

Inventors:

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Background

Research is being conducted to develop new sources of energy from carbohydrate containing biomass resources. Existing technologies to produce liquid fuels from biomass are typically multi-step or energy intensive processes. Ethanol production suffers from low energy density, high volatility and contamination by the absorption of water from the surrounding environment. 2,5-dimethylfuran (DMF), an alternative fuel, has advantages over ethanol, including a higher energy density, a higher boiling point, and lower solubility in water. Previous production methods of DMF involved expensive, energy-consuming separation steps.

Invention Description

The subject invention represents a one step transformation from carbohydrate containing biomass source material to dimethyltetrahydrofuran (DMTHF), which has a higher energy content and provides additional storage stability than DMF. The Penn State researchers demonstrated that this invention's process has high yield and high selectivity. The feedstock can be simple sugars or more complex carbohydrates. The invention includes catalytic compositions specific for this process. The processing temperature ranged around 30°C to 120°C with or without a solvent. Pressures did not exceed 600 psi. The transformation from fructose to DMTHF occurred within two to four (2-4) hours. The separation of the liquid fuels from aqueous solution is fairly straightforward, thereby allowing the energy efficiency to be really high. Additionally, the process can also produce 2-methylcyclopentanone (MCPO), which is another higher energy density liquid fuel candidate.

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