



High Yield Method to Produce HMF from Fructose

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Inventors: James Dumesic, Ali Hussain Motagamwala

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for producing 5-hydroxymethylfurfural (HMF) from C6 carbohydrates using a solvent system containing water and a polar aprotic solvent.

The reaction can be integrated into the conventional route for making high fructose corn syrup. The process is efficient in converting a concentrated fructose stream from an HFCS process to HMF in high yield (>90 percent) at high fructose conversion (>94 percent). HMF produced via this process is easily separated from the solvent system by traditional unit operations.

Overview

The platform molecule 5-hydroxymethylfurfural (HMF), produced from the dehydration of C6 sugars (hexoses), is considered to be one of the top value-added chemicals. The efficient production of HMF from carbohydrates and its subsequent separation from the solvents remains a challenge.

Current methods to produce HMF from biomass-derived sugars using water as a solvent suffer from the drawback of poor selectivity. Improvement in selectivity is observed when solvent systems composed of water and an organic solvent are used; however, HMF loss during difficult product separation typically limits the application of such methods. Moreover, high HMF purity is critical for downstream applications, especially in production of HMF-derived monomers used in sustainable polymer synthesis (e.g., FDCA required for production of PEF).

The Invention

UW–Madison researchers have discovered that a solvent system comprising water and a polar aprotic solvent (e.g., acetone) is ideally suited for converting C6 carbohydrates into HMF at reasonably low temperatures (such as 120°C), low acid concentration and at very high yields and efficiencies.

The C6 carbohydrate used in the method can be derived from any source including biomass (processed or unprocessed), cellulose and lignocellulosic sources, etc. The nature of the C6 carbohydrate is not critical to the method, although fructose is preferred.

Applications

- Production of HMF from fructose/biomass-derived sugars

Key Benefits

- High fructose conversion (>94%)
- High HMF selectivity (>95%)
- High purity HMF (>96% purity)

- Compatible with existing infrastructure in the high fructose corn syrup industry

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WARF
Wisconsin Alumni Research Foundation

| info@warf.org | 608.960.9850

- Solvents are stable, environmentally benign and easy to separate.

Stage of Development

The new method has been shown to convert fructose, in quantitative yield, to HMF, which can be easily separated from the solvent using inexpensive and traditionally used separation techniques. The method improves the economic viability of the biomass upgrading process by reducing the costs associated with the production and separation of HMF, and by also enabling the use of glucose as the feedstock.

Tech Fields

- [Clean Technology : Biobased & renewable chemicals & fuels](#)

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

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