



Solar Cells for Reducing HMF to Valuable Platform Chemicals

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WARF: P150141US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a sustainable method to produce valuable platform chemicals like BHMF.

Overview

A biomass-derived chemical called HMF (5-hydroxymethylfurfural) can be turned into a variety of industrial molecules. For example, it can be reduced to BHMF or 2,5-bis(hydroxymethyl) furan, an important building block molecule used to make biodiesel, polyester and polyurethane foams.

To date, converting HMF to BHMF has required high temperatures and pressure, costly catalysts and hydrogen gas (H_2). Relying on H_2 is problematic because of the energy it takes to produce.

A cheaper, greener and more efficient approach is needed.

The Invention

UW–Madison researchers have developed a high yield method for reducing HMF to valuable furan alcohols including BHMF.

The new method uses electrochemical cells (ECs) or solar-powered photoelectrochemical cells (PECs) to drive the reduction reaction. The cells feature cost-effective catalytic electrodes made of silver film on copper. The reaction takes place at ambient temperature and pressure using water as the hydrogen source.

The process also can be used to produce linear ketones such as 5-MF (5-methylfurfural) using a zinc catalyst.

Applications

- Production of furan alcohols and linear ketones – important building block molecules used to make a variety of materials and chemicals

Key Benefits

- More efficient, higher yields
- Outperforms previous electrochemical methods
- Water is used as the hydrogen source.
- None of the storage/production issues associated with H_2

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- Mild reaction conditions
- Economical catalyst electrodes
- Lower pH solutions, stable conditions

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Stage of Development

The researchers have reduced HMF to BHMF with a Faradaic efficiency and yield exceeding 98 percent.

Additional Information

For More Information About the Inventors

- [Kyoung-Shin Choi](#)

Related Technologies

- [See WARF reference number P150132US01 for information about the researcher's corresponding oxidation method to turn HMF into valuable platform chemicals using solar cells.](#)
- [See WARF reference number P140325US01 for information about the researcher's high performance BiVO₄ photoanode technology.](#)

Tech Fields

- [Clean Technology : Biobased & renewable chemicals & fuels](#)
- [Clean Technology : Solar, wind & water technologies](#)

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

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