



## Green Method for Producing 1,5-Pentanediol Slashes Catalyst Cost 10,000-fold

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new route for producing the high value chemical 1,5-PD via upgrading of biomass-derived tetrahydrofurfuryl alcohol.**

### Overview

Commercial interest in the production of commodity chemicals from renewable sources continues to surge. Among these chemicals,  $\alpha,\omega$ -diols are particularly attractive because of the high market prices they command (\$2,700 – 6,000/MT in 2015 U.S. dollars).

1,5-Pentanediol (1,5-PD), which is used as a plasticizer and also as a precursor in the manufacture of polyurethanes, is especially lucrative because it is currently produced in small quantities from petroleum feedstocks. Research has shown that 1,5-PD can be made from the conversion of tetrahydrofurfuryl alcohol (THFA) using noble metal catalysts. However, subprime yields, high temperature and reliance on high cost catalysts render the process economically infeasible.

### The Invention

Seeking a commercially viable alternative, UW–Madison researchers have developed a new route for producing 1,5-PD from biomass-derived THFA. Their three-step process is orders of magnitude cheaper than competing methods, green and exceeds 90 percent overall yields.

More specifically the new method includes hydration of THFA to dihydropyran, conversion to 2-hydroxy-tetrahydropyran (no need for a mineral acid catalyst) and subsequent production of 1,5-PD. The entire method can be conducted entirely in the absence of noble metal catalysts.

### Applications

- Production of 1,5-PD for use in coatings, polymer resins, plasticizers, acrylates, adhesives and more

### Key Benefits

- New route is cheaper, faster and simpler than competing methods.
- Competes on price with petroleum-derived sources
- Uses inexpensive metal-oxide and base metal catalysts
- Relatively mild reaction conditions
- Higher reactant concentrations cut distillation costs.
- Eliminates difficult and costly acid neutralization step
- Incurs far lower separation costs

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### Stage of Development

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The new method results in >90 percent overall yield for conversion of furfural into 1,5 pentanediol.

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

## Additional Information

### For More Information About the Inventors

- [George Huber](#)

### Publications

- Brentzel Z.J., Barnett K.J., Huang K., Maravelias C.T., Dumesic J.A. and Huber G.W. 2017. Chemicals from Biomass: Combining Ring-Opening Tautomerization and Hydrogenation Reactions to Produce 1,5-Pentanediol from Furfural. ChemSusChem. 10, 1351-1355.
- [Read a news story about this technology.](#)

### Tech Fields

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

For current licensing status, please contact Jennifer Gottwald at [jennifer@warf.org](mailto:jennifer@warf.org) or 608-960-9854

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