

## **Researchers produce cheap sugars for sustainable biofuel production**

September 29 2011



Iowa State researchers have developed thermochemical technologies that efficiently produce sugars from biomass. Lead researcher Robert C. Brown calls the sugars "pyrolytic molasses." Naomi Friend photo. Credit: Naomi Friend/Iowa State Bioeconomy Institute photo.

Iowa State University's Robert C. Brown keeps a small vial of brown, sweet-smelling liquid on his office table.

"It looks like something you could pour on your pancakes," he said. "In many respects, it is similar to molasses."



Brown, in fact, calls it "pyrolytic molasses."

That's because it was produced by the fast <u>pyrolysis</u> of biomass such as corn stalks or <u>wood chips</u>. Fast pyrolysis involves quickly heating the biomass without oxygen to produce liquid or gas products.

"We think this is a new way to make inexpensive sugars from biomass," said Brown, an Anson Marston Distinguished Professor in Engineering, the Gary and Donna Hoover Chair in Mechanical Engineering and the Iowa Farm Bureau Director of Iowa State's Bioeconomy Institute.

That's a big deal because those sugars can be further processed into biofuels. Brown and other Iowa State researchers believe pyrolysis of lignocelluslosic biomass has the potential to be the cheapest way to produce biofuels or biorenewable chemicals.

Brown and Iowa State researchers will present their ideas and findings during tcbiomass2011, the International Conference on Thermochemical Conversion Science in Chicago Sept. 28-30. On Thursday, Sept, 29, Brown will address the conference with a plenary talk describing how large amounts of sugars can be produced from biomass by a simple pretreatment before pyrolysis. He'll also explain how these sugars can be economically recovered from the products of pyrolysis.

A poster session following Brown's talk will highlight thermochemical technologies developed by 19 Iowa State research teams, including processes that:

- increase the yield of sugar from fast pyrolysis of biomass with a pretreatment that neutralizes naturally occurring <u>alkali</u> that otherwise interferes with the release of sugars
- prevent burning of sugar released during pyrolysis by rapidly



transporting it out of the hot reaction zone

- recover sugar from the heavy end of bio-oil that has been separated into various fractions
- separate sugars from the heavy fractions of bio-oil using a simple water-washing process.

In addition to Brown, key contributors to the pyrolysis research at Iowa State include Brent Shanks, the Mike and Jean Steffenson Professor of Chemical and Biological Engineering and director of the National Science Foundation Engineering Research Center for Biorenewable Chemicals based at Iowa State; Christopher Williams, professor of civil, construction and environmental engineering; Zhiyou Wen, associate professor of food science and human nutrition; Laura Jarboe, assistant professor of chemical and biological engineering; Xianglan Bai, adjunct assistant professor of aerospace engineering; Marjorie Rover and Sunitha Sadula, research scientists at the Center for Sustainable Environmental Technologies; Dustin Dalluge, a graduate student in mechanical engineering; and Najeeb Kuzhiyil, a former doctoral student who is now working for GE Transportation in Erie, Penn.

Their work has been supported by the eight-year, \$22.5 million ConocoPhillips Biofuels Program at Iowa State. The program was launched in April 2007.

Brown said Iowa State will – literally – take a bus load of students and researchers to the Chicago conference to present their work on thermochemical technologies, including production of sugars from biomass.

"The Department of Energy has been working for 35 years to get sugar out of biomass," Brown said. "Most of the focus has been on use of enzymes, which remains extremely expensive. What we've developed is a simpler method based on the heating of <u>biomass</u>."



## Provided by Iowa State University

Citation: Researchers produce cheap sugars for sustainable biofuel production (2011, September 29) retrieved 6 May 2024 from <u>https://phys.org/news/2011-09-cheap-sugars-sustainable-biofuel-production.html</u>

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