

'Green' gasoline on the horizon?

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University of Oklahoma researchers believe newer, more environmentally friendly fuels produced from biomass could create alternative energy solutions and alleviate dependence on foreign oil without requiring changes to current fuel infrastructure systems. According to Lance Lobban, director of the School of Chemical, Biological and Materials Engineering, the development of "green" fuels is an important part of the world's, and Oklahoma's, energy future.

Professor Lobban and his research group are interested in how best to use catalysts (solids that accelerate certain chemical reactions) and chemical reactors to convert biomass into new fuels. "The best fuels are the ones that closely duplicate gasoline, diesel and jet fuel so automakers aren't forced to adapt to new fuels," says Lobban. "That would add expense and slow adoption of new fuels. We have to design processes to convert biomass so the product works with the current system."

OU's chemical engineers use principles of molecular engineering to identify the best fuel molecules that might be produced from biomass, and then they develop the catalysts to produce those molecules. "An initial step we're investigating is pyrolysis, which converts the solid biomass to liquids through a high-temperature, non-combustion process that breaks large, solid molecules into smaller liquid ones without breaking them up too far," says Lobban.

This "bio oil" looks like crude oil, but its chemical composition is very different. The same catalysts used in traditional petroleum refineries cannot be used to convert bio oil to fuels, but the same ideas apply. "The

idea is to use a series of catalytic and separation steps to create the desired fuel molecules," says Lobban. "That's really the core of our research."

Most biomass-based fuels can't compete economically with \$50 per barrel oil. But as oil becomes more expensive, and as it becomes more important to limit greenhouse gas emissions ("green" gasoline would be essentially carbon-neutral since its source is plants, which remove CO₂ from the atmosphere), alternate fuels such as these will become increasingly desirable. In addition, dependence on foreign oil forces the United States into unwanted, and dangerous, situations. According to Lobban, "Basing new fuels on energy crops would greatly benefit rural America, where the crops would grow."

Incentives are needed to spur investments in new processes and fuels, and Lobban believes that Oklahoma is an ideal place for these investments. "The Oklahoma Bioenergy Center represents one of the few U.S. research programs that is developing the entire value chain of energy crops—plant development, agriculture, conversion and even fuel combustion. The OBC has world-class expertise in all these areas, looking not just at production of green gasoline, but also ethanol and other fuels." For Lobban and other researchers in Oklahoma, this is the new energy horizon.

Source: University of Oklahoma

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