Argonne NATIONAL LABORATORY

News Release

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Algae could one day be major hydrogen fuel source

ARGONNE, Ill. (April 1, 2008) – As gas prices continue to soar to record highs, motorists are crying out for an alternative that won't cramp their pocketbooks.

Scientists at U.S. Department of Energy's Argonne National Laboratory are answering that call by working to chemically manipulate algae for production of the next generation of renewable fuels – hydrogen gas.

"We believe there is a fundamental advantage in looking at the production of hydrogen by photosynthesis as a renewable fuel," senior chemist David Tiede said. "Right now, ethanol is being produced from corn, but generating ethanol from corn is a thermodynamically much more inefficient process."

Some varieties of algae, a kind of unicellular plant, contain an enzyme called hydrogenase that can create small amounts of hydrogen gas. Tiede said many believe this is used by nature as a way to get rid of excess reducing equivalents that are produced under high light conditions, but there is little benefit to the plant.

Tiede and his group are trying to find a way to take the part of the enzyme that creates the gas and introduce it into the photosynthesis process.

The result would be a large amount of hydrogen gas, possibly on par with the amount of oxygen created.

"Biology can do it, but it's making it do it at 5-10 percent yield that's the problem," Tiede said. "What we would like to do is take that catalyst out of hydrogenase and put it into the photosynthetic protein framework. We are fortunate to have Professor Thomas Rauchfuss as a collaborator from the University of Illinois at Champaign-Urbana who is an expert on the synthesis of hydrogenase active site mimics."

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Algae has several benefits over corn in fuel production. It can be grown in a closed system almost anywhere, including deserts or even rooftops, and there is no competition for food or fertile soil. Algae is also easier to harvest because it has no roots or fruit and grows dispersed in water.

"If you have terrestrial plants like corn, you are restricted to where you could grow them," Tiede said. "There is a problem now with biofuel crops competing with food crops because they are both using the same space. Algae provide an alternative, which can be grown in a closed photobioreactor analogous to a microbial fermentor that you could move any place."

Tiede admitted the research is its beginning phases, but he is confident in his team and their research goals. The next step is to create a way to attach the catalytic enzyme to the molecule.

Funding for the research was provided by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences.

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