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Sunshine-to-Petrol Project Seeks Fuel From Thin Air

ScienceDaily (Dec. 10, 2007) — Using concentrated solar energy to reverse combustion, a research team from Sandia National Laboratories is building a prototype device intended to chemically “reenergize” carbon dioxide into carbon monoxide using concentrated solar power. The carbon monoxide could then be used to make hydrogen or serve as a building block to synthesize a liquid combustible fuel, such as methanol or even gasoline, diesel and jet fuel.

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The prototype device, called the Counter Rotating Ring Receiver Reactor Recuperator (CR5, for short), will break a carbon-oxygen bond in the carbon dioxide to form carbon monoxide and oxygen in two distinct steps. It is a major piece of an approach to converting carbon dioxide into fuel from sunlight.

The Sandia research team calls this approach “Sunshine to Petrol” (S2P). “Liquid Solar Fuel” is the end product — the methanol, gasoline, or other liquid fuel made from water and the carbon monoxide produced using solar energy.

CR5 inventor Rich Diver says the original idea for the device was to break down water into hydrogen and oxygen. The hydrogen could then fuel a potential hydrogen economy.

The Sandia researchers came up with the idea to use the CR5 to break down carbon dioxide, just as it would water. Over the past year they have shown proof of concept and are completing a prototype device that will use concentrated solar energy to reenergize carbon dioxide or water, the products of combustion. This will form carbon monoxide, hydrogen, and oxygen, which ultimately could be used to synthesize liquid fuels in an integrated S2P system.

Coresearchers on the project are Jim E. Miller and Nathan Siegel. Project champion is Ellen B. Stechel, manager of



Sandia researcher Rich Diver checks out the solar furnace which will be the initial source of concentrated solar heat for the CR5 prototype. Eventually parabolic dishes will provide the thermal energy. (Credit: Photo by Randy Montoya)

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The invention, though promising, is far from being on the market to reduce carbon dioxide

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As an example, he says, power plant. The carbon would be captured and r

CR5. The carbon monox making gasoline, jet fuel, liquid fuel.

The prospect of a liquid fuel that can be used in the current gasoline and oil infrastructure. After the synthesized fuel is made from the carbon monoxide, it could be transported through a pipeline or put in a truck and hauled to a gas station, just like gasoline refined from petroleum is now. Plus it would work in ordinary gasoline and diesel engine

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Miller says that while the first step would be to capture the carbon dioxide from sources where it is concentrated — e.g., power plants, smokestacks, and breweries — the ultimate goal would be to snatch it out of the air. A S2P system that includes atmospheric carbon dioxide capture could produce carbon-neutral liquid fuels.

Our overall objective with this prototype is to demonstrate the practicality of the CR5 concept and to determine how test results from small-scale testing can be expanded to work in real devices, Miller says. The design is conservative and we welcome both positive and negative comments. Have any problems using the site? Questions?

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hydrogen and oxygen. That will be followed by tests that similarly break down carbon dioxide to carbon monoxide and oxygen.

Besides having a nearly completed prototype, the research team has already proven that the chemistry works repeatedly through multiple cycles without losing performance and on a short enough cycle time for a practical device.

"We just now have to do it all in one continuous working device," Siegel says.

Adapted from materials provided by [Sandia National Laboratories](#).

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