Scientist shines laser light on methane in pursuit of clean fuel

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An abundant greenhouse gas could someday help clean up the earth. Converting methane to liquid methanol could produce clean, low-cost fuel and prevent the potent greenhouse gas from entering the atmosphere. Exploiting methane in this way could also produce a hydrogen source for fuel cells and yield other industrial applications.

The key to taming methane, and synthesizing it in the laboratory, rests in identifying the starter link in methane's armor chain of hydrocarbons.

A National Science Foundation grant is supporting a novel approach using laser light to convert methane into methanol. Roger Dube, research professor at Rochester Institute of Technology's Chester F. Carlson Center for Imaging Science, won the $79,000 exploratory research award to apply optical catalytic conversion to the problem. Dube will use finely tuned laser light, not heat, to reduce the barrier to reaction in methane and to create longer chain molecules or fuels. The process works without the need for heat or a catalytic surface. This is important because heat consumes some of the fuel stock and decreases overall conversion efficient. Catalysts get dirty and have to be replaced or cleaned, both expensive and time-consuming propositions.

"Successful photo-catalysis of methane would theoretically produce clean fuels and remove methane gas that otherwise would simply be released into the atmosphere," Dube says. "If successful, the technology could have broad impact in other fields of chemistry."

According to the Environmental Protection Agency, methane—the odorless component of natural gas—remains in the atmosphere for approximately nine to 15 years. To make matters worse, methane beats carbon dioxide in efficiently trapping heat in the atmosphere. Sources of the gas range from the expected—such as cattle, coal mining and natural gas and petroleum production—to the somewhat unexpected practice of rice cultivation. Methane has ample natural and human-caused sources and is a byproduct of wetlands, wildfires, permafrost, landfills, agricultural applications, coal mining, stationary and mobile combustion, wastewater treatment and certain industrial processes.

"Unfortunately, almost half of the proven reserve of methane is 'stranded,'" Dube says. "Access to the natural gas is effectively blocked by terrain and the economies of converting natural gas to liquid for efficient transport. A compact, high-gain process is needed that would convert methane gas to a room temperature liquid, such as diesel, and be sufficiently portable to enable access to stranded gas."

Source: Rochester Institute of Technology (news : web)