
# Visible-Range Sunlight Drives $CO_2$ Reduction Process for Cheaper Syngas

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Inventors: George Huber, Aniruddha Upadhye, Insoo Ro, Maria Isabel Tejedor-Anderson, Hyung Ju Kim

**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for photocatalytically reducing $CO_2$ to CO at unprecedented reaction rates.**

## Overview

In a reverse water gas shift reaction, $CO_2$ is reduced to water and carbon monoxide (CO). The CO generated by this reaction is a key component in synthesis gas, also called syngas, which can be converted to liquid fuels using existing technologies.

This endothermic reaction must be driven by outside energy. The ability to harness sunlight reduces fossil energy inputs, improves overall efficiency and makes the process industrially relevant.

## The Invention

UW–Madison researchers have developed a new method of reducing $CO_2$ to CO via a reverse water gas shift reaction using visible solar light. The reaction produces a syngas mixture which can be further converted to liquid fuels.

In this process, $CO_2$ (which can be obtained from many industrial processes) is contacted with a plasmonic catalyst in the presence of hydrogen. The catalyst is exposed to visible-range sunlight so that it undergoes an optical phenomenon called surface plasmon resonance, which causes metal electrons to oscillate in a certain way and accelerates the rate of $CO_2$ reduction.

The process results in $CO_2$ being reduced to water and CO that can be collected for downstream products.

## Applications

- Cost-effective production of syngas and other downstream products like formic acid and hydrocarbons

## Key Benefits

- Utilizes solar energy
- Achieves light efficiency of at least four percent
- Surface plasmon resonance in the catalyst increases rates of $CO_2$ reduction by a factor of five or more.
- Much more efficient than catalysts that only operate in the UV range

## Stage of Development



## Additional Information

**For More Information About the Inventors**

- George Huber

**Related Technologies**

- WARF reference number P07239US describes a gasification device for producing syngas from biomass.

**Tech Fields**

- Clean Technology : Biobased & renewable chemicals & fuels
- Clean Technology : Solar, wind & water technologies

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854