A “self-heating” boron catalyst that makes particularly efficient use of sunlight to reduce carbon dioxide (CO\textsubscript{2}) serves as a light harvester, photothermal converter, hydrogen generator, and catalyst in one. In the journal Angewandte Chemie, researchers introduce a photothermocatalytic reaction that requires no additives beyond water. This could form the basis of a new, more efficient process for converting the greenhouse gas CO\textsubscript{2} into a useful carbon source for the production of fuels and chemical products.

Irradiation causes the boron particles to heat up to about 378 °C. At this temperature it reacts with water, forming hydrogen and boron oxides in situ. The boron oxides act as “traps” for CO\textsubscript{2} molecules. The hydrogen is highly reactive and, in the presence of the light-activated boron catalyst, efficiently reduces the CO\textsubscript{2} by providing the necessary protons (H\textsuperscript{+}) and electrons.

“The key to our success lies in the favorable properties of the boron powder, which make it an all-in-one catalyst: light harvester, photothermal converter, hydrogen source, and catalyst,” says Ye. “Our study confirms the highly promising potential of a photothermocatalytic strategy for the conversion of CO\textsubscript{2} and potentially opens new vistas for the development of other solar-energy-driven reaction systems.”

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