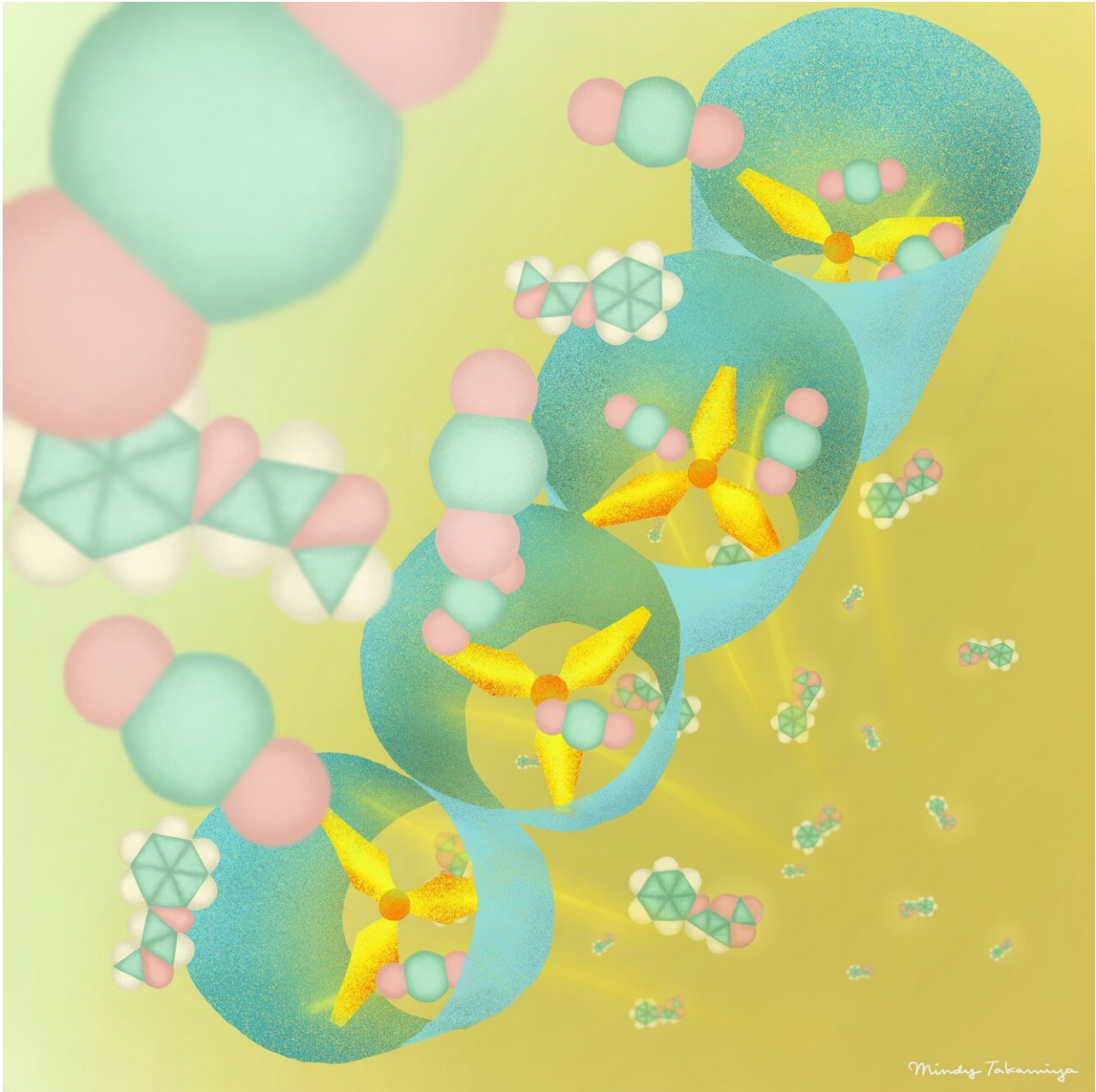


# New material captures carbon dioxide

October 11 2019

---



This new porous coordination polymer has propeller-shaped molecular structures

that enables selectively capturing CO<sub>2</sub>, and efficiently convert the CO<sub>2</sub> into useful carbon materials. Credit: Mindy Takamiya

A new material that can selectively capture carbon dioxide (CO<sub>2</sub>) molecules and efficiently convert them into useful organic materials has been developed by researchers at Kyoto University, along with colleagues at the University of Tokyo and Jiangsu Normal University in China. They describe the material in the journal *Nature Communications*.

Human consumption of fossil fuels has resulted in rising global CO<sub>2</sub> emissions, leading to serious problems associated with global warming and climate change. One possible way to counteract this is to capture and sequester carbon from the atmosphere, but current methods are highly energy intensive. The low reactivity of CO<sub>2</sub> makes it difficult to capture and convert it efficiently.

"We have successfully designed a [porous material](#) which has a [high affinity](#) towards CO<sub>2</sub> molecules and can quickly and effectively convert it into useful organic materials," says Ken-ichi Otake, Kyoto University materials chemist from the Institute for Integrated Cell-Material Sciences (iCeMS).

The material is a porous coordination polymer (PCP, also known as MOF; metal-organic framework), a framework consisting of zinc metal ions. The researchers tested their material using X-ray [structural analysis](#) and found that it can selectively capture only CO<sub>2</sub> molecules with ten times more efficiency than other PCPs.

The material has an organic component with a propeller-like molecular structure, and as CO<sub>2</sub> molecules approach the structure, they rotate and rearrange to permit CO<sub>2</sub> trapping, resulting in slight changes

to the molecular channels within the PCP—this allows it to act as molecular sieve that can recognize molecules by size and shape. The PCP is also recyclable; the efficiency of the catalyst did not decrease even after 10 reaction cycles.

"One of the greenest approaches to [carbon capture](#) is to recycle the carbon dioxide into high-value chemicals, such as cyclic carbonates which can be used in petrochemicals and pharmaceuticals," says Susumu Kitagawa, materials chemist at Kyoto University.

After capturing the carbon, the converted material can be used to make polyurethane, a material with a wide variety of applications including clothing, domestic appliances and packaging.

This work highlights the potential of porous coordination polymers for trapping [carbon dioxide](#) and converting into useful materials, opening up an avenue for future research into carbon capture materials.

**More information:** Pengyan Wu et al. Carbon dioxide capture and efficient fixation in a dynamic porous coordination polymer, *Nature Communications* (2019). [DOI: 10.1038/s41467-019-12414-z](https://doi.org/10.1038/s41467-019-12414-z)

Provided by Kyoto University

Citation: New material captures carbon dioxide (2019, October 11) retrieved 30 April 2024 from <https://phys.org/news/2019-10-material-captures-carbon-dioxide.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.