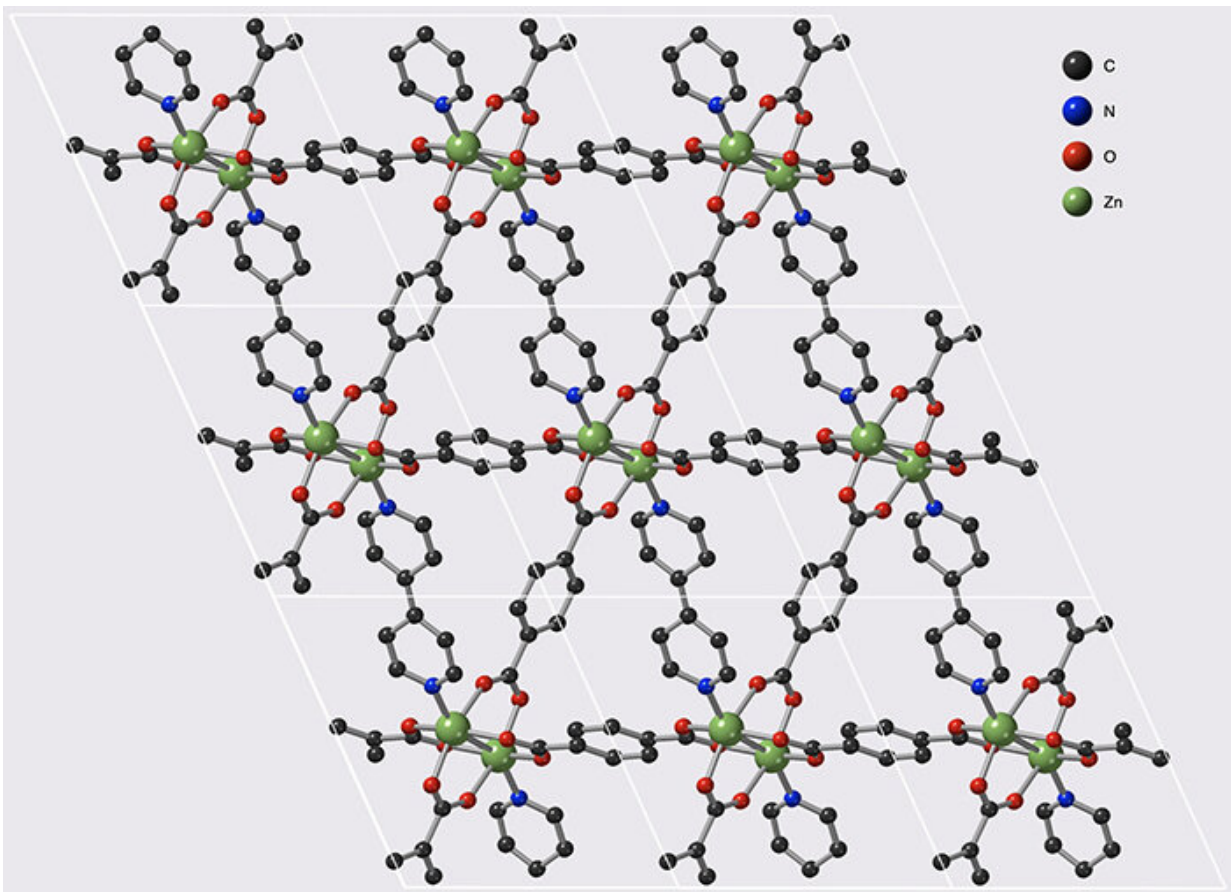


# New materials for storing flammable industrial gases

April 21 2022



Structure of the Metal-Organic Framework MOF-508, composed of carbon (black), nitrogen (blue), oxygen (red) and zinc (green). The flexibility and catenated nature of this framework are key parameters for the storage of acetylene. Credit: © François-Xavier Coudert/CNRS

How do I store more, and better? This summarizes the challenge of transporting flammable gases. To ensure industrial safety, these gases must be handled at defined temperature and pressure conditions that do not allow for optimal storage and release cycles. Existing porous materials can facilitate the capture of certain gases, but their high affinity for these molecules complicates their release: a large amount of gas then remains trapped in the host material.

Scientists have just shown that new patented materials could provide a solution, by demonstrating their ability to capture and release [acetylene](#). For a given volume, they can store and release 90 times more acetylene. In that step, it is even possible to recover 77% of the gas stored in a cylinder—far more than with existing porous materials. And all this is at temperature and pressure conditions suitable for industrial applications.

These materials belong to the family of Metal-Organic frameworks (MOFs) that form nanoporous crystal structures. The MOFs studied during this work have the peculiarity of being flexible, and thus offer two states: "open" and "closed," facilitating gas storage and release respectively. In addition, they can be modified to control the storage-release pressure very finely, and thus are suitable for various industrial constraints.

Based on these results, the research team plans to test new modifications to give these flexible MOFs novel properties, for example to facilitate the capture of CO<sub>2</sub>, methane or hydrogen. Reducing the cost of these new materials remains a major objective in order to develop industrial applications.

This research was carried out as part of the International Research Project SMOLAB, which concentrates and reinforces complementary French and Japanese strengths in the field of flexible MOFs and their applications. SMOLAB was created in 2018 by the University of Kyoto

and the CNRS, in partnership with avec Air Liquide, Claude Bernard University Lyon 1, Chimie ParisTech / PSL University.

**More information:** Susumu Kitagawa, Tunable acetylene sorption by flexible catenated metal–organic frameworks, *Nature Chemistry* (2022).

[DOI: 10.1038/s41557-022-00928-x](https://doi.org/10.1038/s41557-022-00928-x).

[www.nature.com/articles/s41557-022-00928-x](https://www.nature.com/articles/s41557-022-00928-x)

Provided by CNRS

Citation: New materials for storing flammable industrial gases (2022, April 21) retrieved 16 August 2024 from <https://phys.org/news/2022-04-materials-flammable-industrial-gases.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.