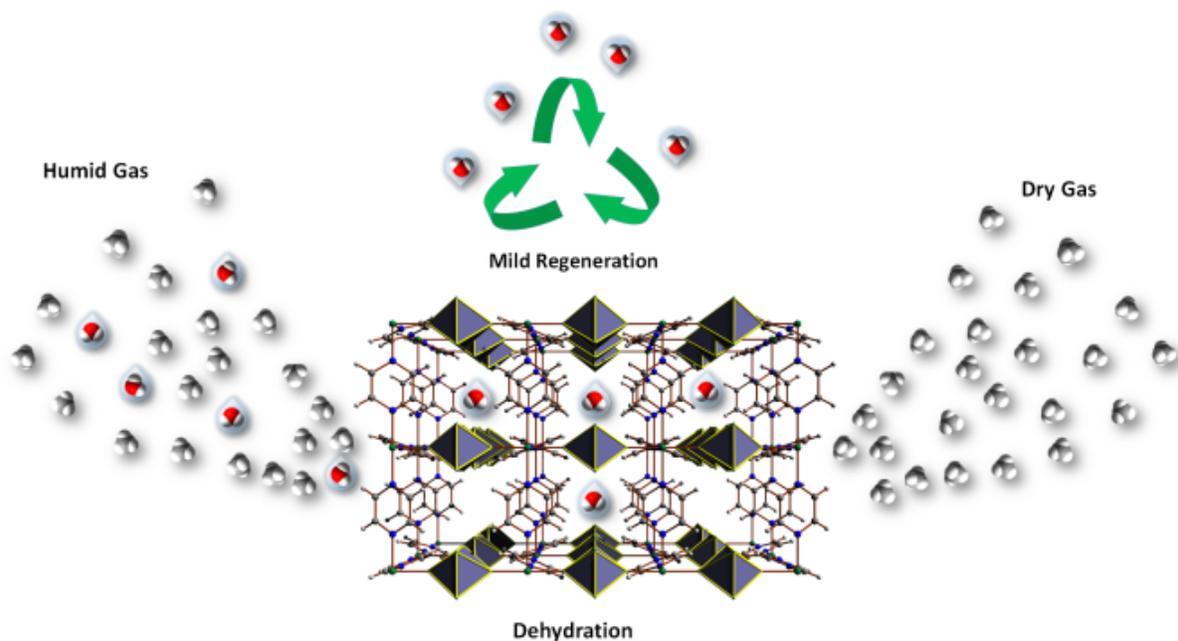


MOFs provide a better way to remove water from gas

May 18 2017



Energy efficient gas drying achieved by a metal-organic framework. Credit: © 2017 Mohamed Eddaoudi

A breakthrough in generating water-stable metal-organic frameworks allows efficient removal of water from gases.

The conventional view that [metal-organic frameworks](#) (MOFs) cannot be stable in [water](#) has been overturned by the development of an MOF that

can selectively and effectively adsorb water to dry gas streams.

"The achievement of energy efficient dehydration by our MOF is revolutionary," said Professor Mohamed Eddaoudi, Director of the Advanced Membranes and Porous Materials (AMPM) at the KAUST Division of Physical Science and Engineering.

Gases, such as natural gas, must be dehydrated before transportation and use to avoid problems including pipeline corrosion and blockages due to methane ice formation. Conventional drying agents require an energy-intensive regeneration cycle.

The new fluorinated MOF developed by the KAUST team achieves the drying and regeneration cycle at relatively low temperatures and requires about half the energy input of conventional procedures. This dramatic reduction in energy use highlights the obvious potential for upscaling the innovation to bring huge efficiency savings in the gas production and transport industry.

MOFs are hybrid organic-inorganic materials that contain metal ions or clusters held in place by organic molecules known as linkers. Varying the metal components and organic linkers allows researchers to fine-tune the structure and chemical properties of MOFs. A major aim of this fine-tuning is to create MOFs with cavities that will selectively bind to and retain specific molecules, such as the water that must be removed from a gas stream.

"Initially, our aim was to adapt our recently introduced fluorine-containing MOFs, to include a periodic array of open metal sites and fluorine centers in the contracted pore system, to achieve various key separations," said Eddaoudi. This exploration led to the discovery of a water-stable MOF— now labeled KAUST-8— with unique water adsorption properties and outstanding recyclable dehydration

capabilities. Significantly, KAUST-8 removes carbon dioxide along with water, which is a common requirement in industrial gas processing.

"I have no doubt that this discovery will inspire scientists in academia and industry to explore MOFs to address other challenges," said Eddaoudi. The KAUST team sees additional possibilities may include the removal of water from liquids, such as inks and solvents used in the electronics industry.

More information: [DOI: 10.1126/science.aam8310](https://doi.org/10.1126/science.aam8310) A. Cadiou et al., "Hydrolytically stable fluorinated metal-organic frameworks for energy-efficient dehydration," *Science* (2017). science.sciencemag.org/cgi/doi/10.1126/science.aam8310

Provided by King Abdullah University of Science and Technology

Citation: MOFs provide a better way to remove water from gas (2017, May 18) retrieved 26 April 2024 from <https://phys.org/news/2017-05-mofs-gas.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.