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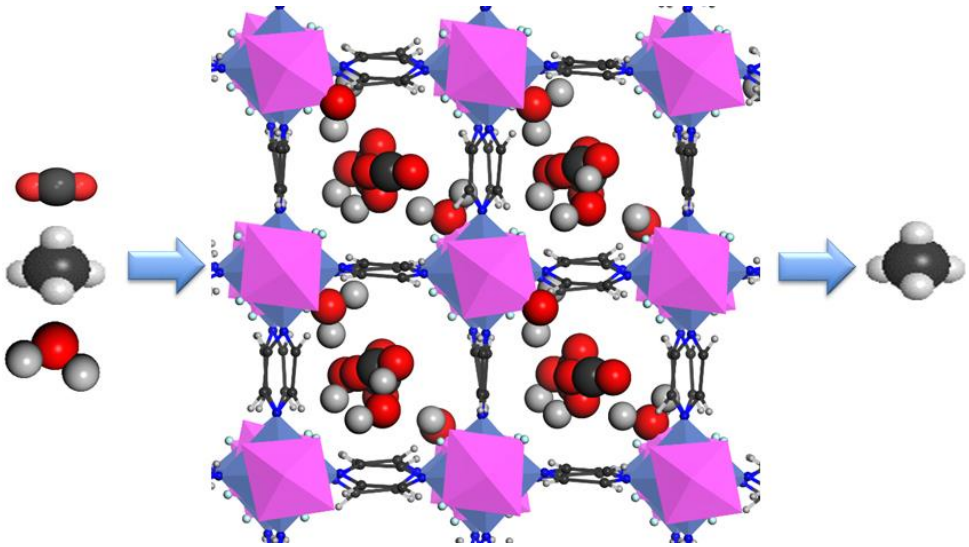
A new material for purifying natural gas

The fields of gas filtration and purification require materials whose porosity can be perfectly controlled. Zeolites, which are porous inorganic compounds, are the most frequently used today, although large amounts of energy are needed to recycle them. Researchers from King Abdullah University of Science and Technology (KAUST)[1], l'Institut Lavoisier Versailles (CNRS/Université de Versailles Saint-Quentin-en-Yvelines), and l'Institut Charles Gerhardt Montpellier (CNRS/Université de Montpellier/ENSCM) recently synthesized KAUST-8, a metal organic framework (MOF) that dehydrates natural gas, purifies it of CO_2, and has the advantage of being easy to recycle. The research was published in the journal *Science* on May 19, 2017.

When natural gas is extracted from the soil, the water and CO_2 it contains must be eliminated in order to have only methane. This separation takes place through the use of various materials such as zeolites, which are incredibly porous aluminosilicate crystals. While very effective, they require a great deal of energy to be regenerated between each use. Researchers at KAUST University, l'Institut Lavoisier Versailles, and l'Institut Charles Gerhardt Montpellier have succeeded in conceiving a highly stable and easily recyclable new material: KAUST-8. It belongs to the family of metal organic frameworks (MOF), crystalline materials consisting of metallic ions and organic ligands. It was created through the combination of fluorinated aluminum units and pyrazine ligands.

KAUST-8 has the form of a three-dimensional network that generates tunnels so small (0.36 nanometers) that they do not allow methane molecules to enter. Water and carbon dioxide molecules can however pass through, and remain trapped by interactions with various sites: water on metallic sites of aluminum, and carbon dioxide toward fluorine atoms and pyrazine, which are projected by computer simulations. KAUST-8 is thus able to purify natural gas with a significantly higher level of performance than the other molecular sieves currently used. This research also shows that it is possible to modulate the structural and chemical properties of MOFs in order to adapt them to the separation of larger molecules, which is of great interest in the fields of energy and the environment.

(1) King Abdullah University of Science and Technology.



At left, natural gas contains CO_2, methane and water. Upon contact with KAUST-8 at center, the CO_2 and water are trapped. At right, only the methane remains.

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Reference

Hydrolytically stable fluorinated metal-organic frameworks for energy-efficient dehydration, Amandine Cadiau, Youssef Belmabkhout, Karim Adil, Prashant M. Bhatt, Renjith S. Pillai, Aleksander Shkurenko, Charlotte Martineau-Corcos, Guillaume Maurin, Mohamed Eddaoudi, *Science*, May 19, 2017 10.1126/science.aam8310

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