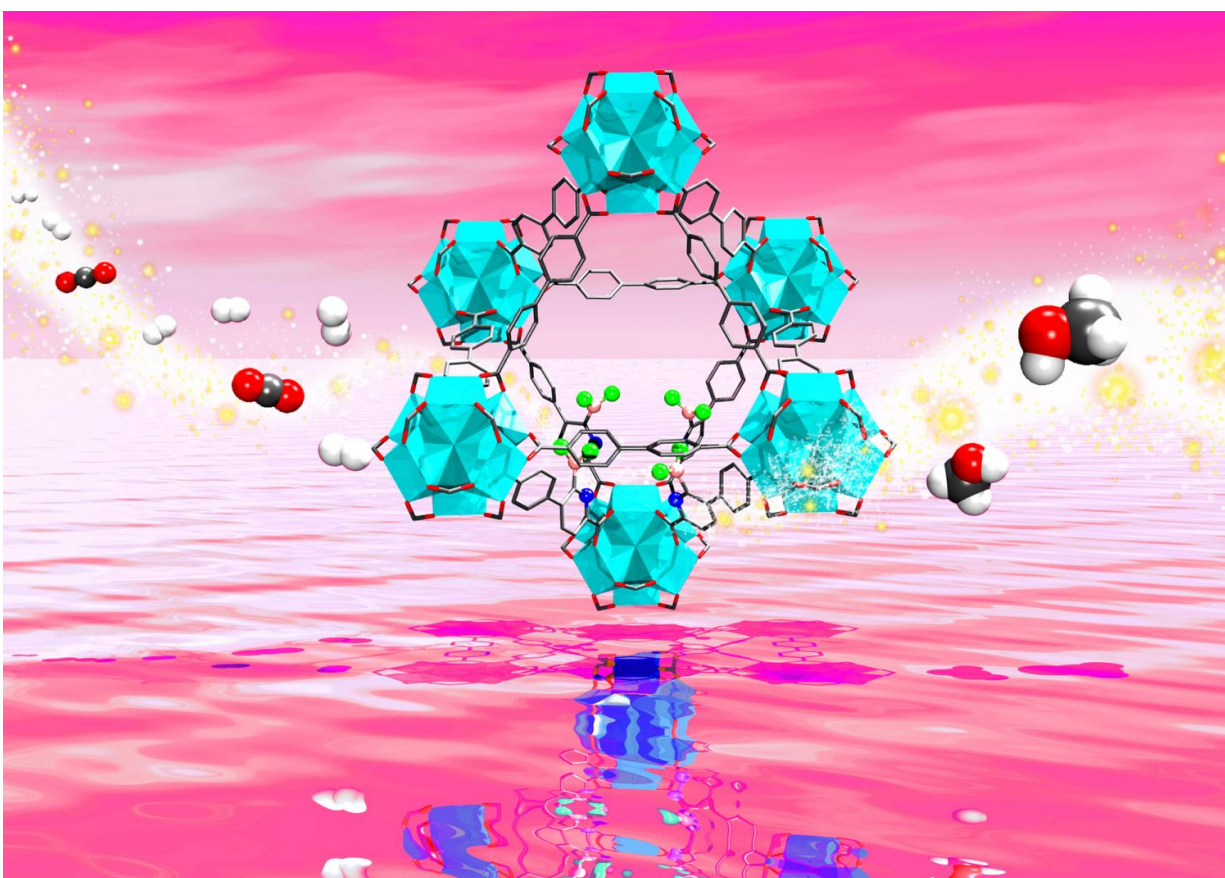


Closing the carbon loop: Team identifies new catalyst that advances capture, conversion of atmospheric carbon dioxide

December 7 2016, by Paul Kovach



Artists rendition of a catalyst (light blue and gray framework) capable of capturing CO₂ (red and gray molecules on left side) and, along with hydrogen (white molecules) converting it to methanol (red, gray and white molecules on the right). Credit: University of Pittsburgh

Research at the University of Pittsburgh's Swanson School of Engineering focused on developing a new catalyst that would lead to large-scale implementation of capture and conversion of carbon dioxide (CO₂) was recently published in the Royal Society of Chemistry journal *Catalysis Science & Technology*.

Principal investigator is Karl Johnson, the William Kepler Whiteford Professor in the Swanson School's Department of Chemical & Petroleum Engineering. Postdoctoral associate Jingyun Ye is lead author. The article "Catalytic Hydrogenation of CO₂ to Methanol in a Lewis Pair Functionalized MOF", is featured on the cover of *Catalysis Science & Technology* (vol. 6, no. 24) and builds upon Dr. Johnson's previous research that identified the two main factors for determining the optimal catalyst for turning atmospheric CO₂ into liquid fuel. The research was conducted using computational resources at the University's Center for Simulation and Modeling.

"Capture and conversion of CO₂ to methanol has the potential to solve two problems at once – reducing net [carbon dioxide](#) emissions while generating cleaner fuels," Dr. Johnson explained. "Currently, however, it is a complex and expensive process that is not economically feasible. Because of this, we wanted to simplify the catalytic process as much as possible to create a sustainable and cost-effective method for converting CO₂ to fuel – essentially to reduce the number of steps involved from several to one."

Johnson and Ye focused on computationally designing a catalyst capable of producing methanol from CO₂ and H₂ utilizing [metal organic frameworks](#) (MOFs), which potentially provide pathway for a single-process unit for [carbon capture](#) and conversion. The MOFs could dramatically reduce the cost of carbon capture and conversion, bringing the potential of CO₂ as a viable feedstock for fuels closer to reality.

"Methanol synthesis has been extensively studied because [methanol](#) can work in existing systems such as engines and fuel cells, and can be easily transported and stored. Methanol is also a starting point for producing many other useful chemicals," Dr. Johnson said. "This new MOF catalyst could provide the key to close the carbon loop and generate fuel from CO₂, analogously to how a plant converts carbon dioxide to hydrocarbons."

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More information: Jingyun Ye et al. Catalytic hydrogenation of CO to methanol in a Lewis pair functionalized MOF, *Catal. Sci. Technol.* (2016). [DOI: 10.1039/C6CY01245K](https://doi.org/10.1039/C6CY01245K)

Provided by University of Pittsburgh

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