HIGHLIGHT

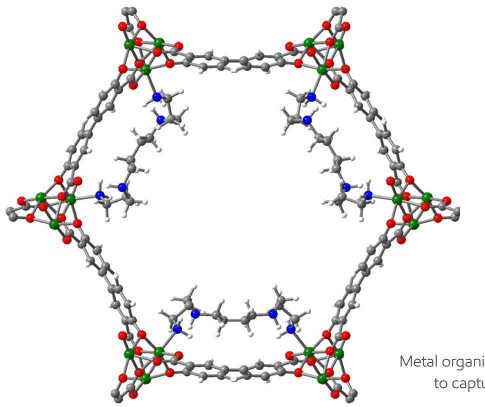
# NEXT-GENERATION TECHNOLOGY

## Existing and emerging technologies are often challenged by scale and cost limitations, making it necessary to discover new materials and process innovations that reduce greenhouse gas emissions on a life-cycle basis.

ExxonMobil scientists together with the University of California, Berkeley, published joint research in the peer-reviewed journal *Science* on the discovery of a new metal organic framework (MOF) material that captures and later releases $CO_2$ like an on/off switch for storage or utilization. It has the potential to capture more than 90% of $CO_2$ and could prove up to six times more effective than conventional approaches. The MOF is highly selective to $CO_2$ over nitrogen and oxygen and is also stable in steam, opening up many potential new process options[39].

The Company has also worked with researchers from the Georgia Institute of Technology and Imperial College London on membrane technologies. Research results published in *Science* demonstrate the potential for non-thermal fractionation of light crude oil through a combination of class- and size-based "sorting" of molecules[40]. Reducing the amount of energy needed to refine fuels could dramatically reduce emissions from the refining process. Initial prototypes have shown these membranes to be twice as effective in separating gasoline and jet fuel molecules as the most selective commercial membranes in use today.

In another R&D collaboration, ExxonMobil is working with Global Thermostat to develop the potential of large-scale deployment of direct air capture. The companies also continue to develop novel processes and materials that increase the rate of $CO_2$ capture and reduce the amount of energy required in the process. While more research and development is needed, direct air capture is increasingly recognized to have a significant role to play in global decarbonization efforts.



Metal organic frameworks could offer higher selectivity to capture $CO_2$ versus conventional approaches[39]