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New platforms for gas separations and storage, chemical sensing, and catalysis

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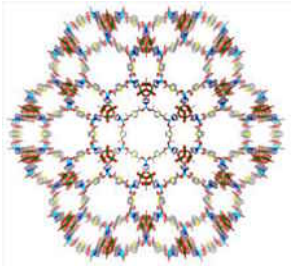
Over the past two decades Metal-Organic Materials (MOMs), as exemplified by porous coordination polymers, discrete metal-organic polyhedra and metal-organic frameworks, have experienced tremendous growth in both the number of research papers and their impact. MOMs are receiving such attention thanks to their modular nature which affords them the potential to offer game-changing solutions for several important technological problems. MOMs can exhibit permanent porosity and many of their most anticipated applications, such as gas storage (carbon dioxide sequestration, natural gas, and hydrogen storage for energy applications), chemical separations, chemical sensing, catalysis, and drug delivery, involve the uptake or encapsulation of guests. Further, as they can often be obtained in a crystalline form, MOMs are also well suited to act as platforms materials for probing structure-property relationships. This presentation will survey several promising new MOM platforms that are being pursued by our research group and will address their performance with respect to carbon dioxide capture and sequestration, natural gas storage, and catalysis. Additionally, we will place these results in the context of the "2-step" crystal engineering principles that guided our research into the rational design of these high-performance materials (see Figure).



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