



METAL–ORGANIC FRAMEWORKS

Enzyme pretenders

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Nature Nanotechnology | doi:10.1038/nnano.2016.145

Published 03 August 2016

[Citation](#) [Reprints](#) [Rights & permissions](#) [Article metrics](#)**Subject terms:** [Materials for energy and catalysis](#) · [Metal–organic frameworks](#)*J. Am. Chem. Soc.* **138**, 8352–8355 (2016)

Metal–organic frameworks (MOFs) are used for a range of applications, including gas storage, sensing and catalysis. While some post-synthetic modifications of MOFs are known, this concept has now been taken significantly further. F. Dean Toste, Omar Yaghi and colleagues from the University of California, Berkeley, and the National University of Cordoba, Argentina have introduced short peptides into the framework's pores in a step towards using these materials as enzyme-like catalysts.

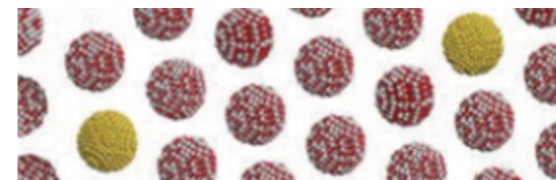
The authors first made post-synthetic modifications to functionalize the organic struts of the MOF. Using classical peptide couplings, up to 7 modifications were made while still retaining the crystalline and porous scaffold. These peptide additions reduced the pore space, indicating the potential applications for molecular confinement. One of the MOFs was found to catalyse the stereoselective chlorination of butyraldehyde, giving the product in 20% e.e. The authors then attempted sequence-specific peptide cleavage. Inspired by the active site of the tobacco etch virus, a MOF with a Cys–His–Asp chain was designed as a synthetic endopeptidase. This selectively cleaves the Ser peptide bond of a short peptide in 5% yield after 24 h.

While the reported catalytic activities and selectivities are quite low, they are averaged values of the system, which, at this stage, does not contain uniformly functionalized pores. However, these results suggest that MOF-based strategies could be optimized further for selective transformations.

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