

Functionalization of metal-organic frameworks for improved catalysis

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Metal-organic frameworks (MOFs) have witnessed their great potential in wide fields, particularly in catalysis, in recent years. Unfortunately, the types of active sites in classical MOF structures are limited, resulting in their applicability in limited catalytic reactions. Therefore, different functionalization strategies for MOFs have been developed toward catalytic applications in expanded scope of reactions.

Organic ligand functionalization is the most simple and direct strategy. We have assembled highly stable and porous porphyrinic MOFs featuring enhanced visible light absorption, which were investigated for photocatalytic CO₂ reduction with high efficiency and selectivity.¹⁻²

The pore character MOFs endows great opportunity to incorporate active species for improved catalysis -- pore space functionalization. The stabilization of guest active centers (particularly, metal nanoparticles) by the pore space of MOFs not only greatly expand the scope of catalytic reactions but also improve the catalytic performance, based on the synergetic properties of the host MOF and guest species.³⁻⁷

In addition, given the concern on water/moisture stability of MOFs toward practical applications, surface functionalization of MOFs by the modification of hydrophobic porous polymer onto MOF surface has been demonstrated to greatly improve the stability and catalytic properties of MOFs.⁸⁻¹⁰

The above studies greatly contribute to the development of functionalization and catalytic applications of MOFs.

References:

- (1) Zhang, Q.; Jiang, H.-L. et al. *J. Am. Chem. Soc.* 2015, 137, 13440.
- (2) Jiang, H.-L. Zhou, H.-C. et al. *J. Am. Chem. Soc.* 2016, 138, 5316.
- (2) Jiang, H.-L. et al. *Angew. Chem. Int. Ed.* 2016, 55, 3685.
- (3) Zhang, Q.; Jiang, H.-L. et al. *Angew. Chem. Int. Ed.* 2016, 55, 9389.
- (5) Jiang, H.-L. et al. *J. Am. Chem. Soc.* 2017, 139, 2035.
- (6) Jiang, H.-L. et al. *Angew. Chem. Int. Ed.* 2017, 56, 563.
- (7) Xu, Q.; Jiang, H.-L. et al. *ACS Catal.* 2015, 5, 2062.
- (8) Jiang, H.-L.; Yu, S.-H. et al. *J. Am. Chem. Soc.* 2014, 136, 16978.
- (9) Yu, S.-H.; Jiang, H.-L. et al. *NPG Asia Mater.* 2016, 8, e253.
- (10) Jiang, H.-L. et al. *Angew. Chem. Int. Ed.* 2016, 55, 7379.

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