MS30-2-6 Mesoporous MOF-based scaffolds for catalysis
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Abstract
Homogeneous and heterogeneous catalysts are known to have opposite characteristics: the main advantage of the first (selectivity/activity) is the main disadvantage of the second, and vice versa (recovery/reuse) [1]. Given their complementarity, merging their properties by heterogenizing the homogeneous catalyst would create a super catalyst.For practical use, the catalyst should be characterizable, cheap, easy to quantitatively recover, as well as environmentally sustainable.Mesoporous Metal Organic Frameworks can be used as heterogeneous substrate for this purpose. Most of the MOF structures that are based on commercially available linkers have micropores (up to 2nm), and this limits their application when considering their use in fields where substrate size is important (e.g. synthesis of APIs).The organic linkers do not only directly affect the final size of the pores but they also contribute, together with the metal core, to the final morphology of the MOFs. The combination of morphology and pore size is crucial for the final application of MOFs.The direct engineering of novel MOFs structure presenting a specific morphology and pore size is possible. To facilitate this, advanced synthetic techniques have been developed to achieve large molecules in a cheap and fast synthesis.[2]According to the isoreticular synthesis principle [3], libraries of MOFs that share the same morphology can be generated by increasing the size of organic linkers but keeping the same metal core.
Basing our approach on this principle, we generated libraries of star-shaped organic linkers (3 and 4-topic) that can be turned into a series of honeycomb (hnb) MOFs. This novel series of MOFs has the characteristics of pore size and morphology that are specifically chosen to better tackle the problem of diffusion of reagents and products, generating a class ofnovel advanced catalysts.

References
[1] J. Čejka, R. E. Morris, P. Nachtigall. (2017). Catalysis Series, Zeolites in Catalysis , DOI: 10.1039/9781788010610-FP001

[2] R. Fucci, C. M. L. Vande Velde. (2021). Faraday Discuss., 97. DOI: 10.1039/D1FD00026H

[3] H. Deng, S. Grunder, K. E. Cordova, C. Valente, H. Furukawa, M. Hmadeh, F. Gándara, A. C. Whalley, Z. Liu, S. Asahina, H. Kazumori, M. O'Keeffe, F. Stoddart, O. M. Yaghi. (2012). Science, 6084, 1018. DOI: 10.1126/science.1220131