ENGINEERING MOFs WITH POLYPHENOLIC PORPHYRINS: FROM STRUCTURAL VERSATILITY TO REDOX AND PHOTOCATATALYTIC PROPERTIES

Fangbing Liu,[a] Siddhartha De,[a] Juan Jose Ramirez Hernandez,[b] Erwann Jeanneau,[a] Thomas Devic,[c] Nathalie Guillou,[d] Sergio Navalon,[c] Alexandra Fateeva [a]

[a] Université Claude Bernard Lyon 1, Laboratoire des Multimatériaux et Interfaces, UMR CNRS 5615, F-69622 Villeurbanne, France
[b] Nantes Université, CNRS, Institut des Matériaux de Nantes Jean Rouxel, IMN, F-44000 Nantes, France
[c] Institut Lavoisier de Versailles, UMR 8180 CNRS UVSQ, Université Paris-Saclay, 45 Avenue des Etats-Unis, 78035 Versailles, France
[d] Departamento de Química, Universitat Politècnica de València, C/Camino de Vera, s/n, 46022 Valencia, Spain

The structural rigidity, high thermal stability and concomitant existence of multiple metal binding sites in porphyrins make them relevant building units for engineering of functional MOFs. [1] On top of that, porphyrin derivatives exhibit exciting physical phenomena such as visible light absorption, energy transfer processes, luminescence, redox activity, photo-, electro- and biomimetic catalytic activity which drives the interest in porous materials derived from these macrocyclic ligands.

In this line of research, our effort focused on the development of novel MOFs featuring original porphyrin linkers. [2] They feature custom-designed polyphenolic porphyrin linkers, that enable the formation of MOFs with enhanced chemical and thermal stability. [3] Through a comprehensive characterization approach involving single crystal and powder synchrotron X-ray diffraction (XRD) in combination with the local information gained from spectroscopic techniques, we elucidated the structural features of a series of new MOFs, which are all based on different inorganic secondary building units [4] (Figure 1). Besides, indigenous redox activity of polyphenol moiety motivated us to explore the photo-redox activity to evaluate the potential for energy-related applications in electrochemical energy storage and photocatalysis. [5]

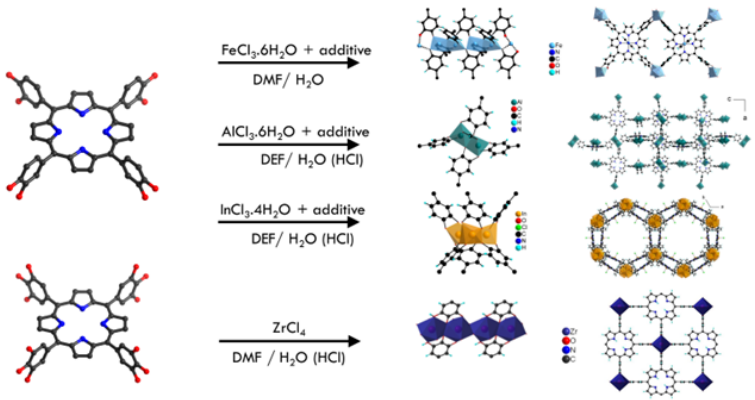

Figure 1: Structural diversity of novel polyphenolic porphyrin-based MOFs

[1] Z. Guo and B. Chen, Dalton Trans. **44**, 14574 (2015).

[2] S. De, T. Devic, and A. Fateeva, Dalton Trans. **50**, 1166 (2021).

[3] G. Mouchaham *et al.*, Chem. Commun. **53**, 7661 (2017).

[4] S. De *et al.*, J. Mater. Chem. A **11**, 25465 (2023).

[5] B. Gikonyo *et al.*, Journal of Materials Chemistry A **10**, 24938 (2022).