Invited speaker

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Solvent-free synthesis of Metal-Organic Frameworks: a route towards elusive materials

Metal-organic frameworks (MOFs), also known as porous coordination polymers (PCPs), have emerged in the last 30 years as revolutionary molecular materials with applications in societal and industrially relevant domains such as storage of fuels (hydrogen and methane), capture of gases (e.g. greenhouse gases), separation, drug delivery and catalysis, among others [1]. Recent advances in this area in the past decade has resulted in an explosive growth in their preparation, characterization, and study, with more than 100.000 MOFs reported. The common property for all these open crystalline frameworks is their permanent porosity constructed from the assembly of inorganic sub-units and organic linkers, providing an assortment of topologies and different architectures that can be intended by chemical design.
Herein we will present an uncommon synthetic approach, very versatile, for the preparation of elusive porous materials, based on the absence of solvents. With this approach, we will first present the iron(II) analogue of ZIF-8 [1]. Then, we will extend this approach for the preparation of multivariate ZIFs, which is typically limited due to the absence of control of topologies when a mixture of ligands/metals is used [2,3]. We will show also its applicability to prepare iron(II) glasses, achieved through a series of solid-state transformations that result in a meltable iron based zeolitic imidazolate framework (ZIF) [4]. And finally, we will use this methodology for the inclusion of catalytically active Pd(II) centres in a highly robust MOF [5].

References

[1] López-Cabrelles J. et al. (2019), doi.org/10.1021/jacs.9b02686
[2] López-Cabrelles J. et al. (2022), doi.org/10.1039/d1sc04779e
[3] León-Alcaide L. et al. (2023), doi.org/10.1021/jacs.3c08017
[4] León-Alcaide L. et al. (2023), doi.org/10.1021/jacs.3c01455
[5] Miguel-Casañ E. et al. (2023), doi.org/10.1039/d2sc05192c