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Generating Novel 2D-MOFs and Chiral 2D-COFs Using Non-Planar Subphthalocyanines

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Atom-thick extended 2D organic frameworks provide new quantum phenomena with distinct electronic states. These networks are typically planar and its conjugation can lead to novel extended electronic states [1-2] or new physical properties such as 2D-ferromagnetism [3]. These atom-thick structures have been commonly obtained under ultra-high-vacuum conditions using planar molecular precursors as building blocks. We go beyond such planar structures and use bowl shaped precursors to generate corrugated networks that introduce higher versatility in the fabrication of organic layers. By means of high-resolution scanning tunnelling microscopy and spectroscopy we find that SubPhthalocyanine molecules produce a highly regular 2D-MOF on Au(111) with unprecedented metal-organic coordination in the form of hexafluor-Au bonds [4]. Moreover, control of chirality can be exerted in the fabricated layers to produce chiral covalent organic frameworks of exceptional quality [5]. Notably, such porous and chiral polymers present π-extended conjugation, as evidenced by scanning tunnelling spectroscopy grids, which pave the way to future nanodevice fabrication with new functionalities and optoelectronic properties.

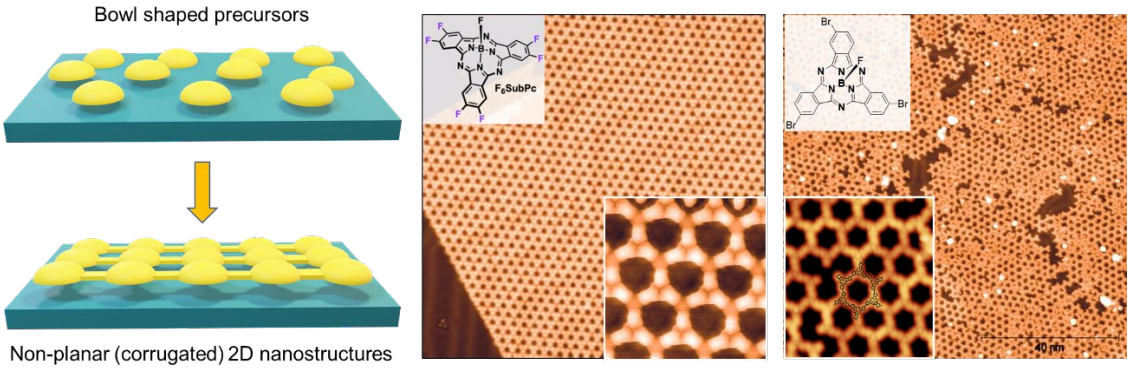


Figure 1. Non-planar 2D structures obtained using bowl-shaped Subphtalocyanines.

References:

[1] L. Hernández-López et al., Nanoscale 13, 5216 (2021).

[2] P. D'Agosta et al., Small 21, 2406533 (2025).

[3] J. Lobo-Checa et al., Nature Communications 15, 1858 (2024).

[4] J. Labella et al., CHEM (2026). *DOI: 10.1016/j.chempr.2026.102967*

[5] J. Labella et al., JACS 144, 16579 (2022).