

Subphthalocyanine-Based Molecular Materials: From Singlet Fission and Molecular Photovoltaics to Chirality and Supramolecular Organization.

Tomás Torres^{a,b,c}

^a Departamento de Química Orgánica, Universidad Autónoma de Madrid, Cantoblanco, 28049 Madrid, Spain.

^b IMDEA-Nanociencia, c/Faraday 9, Campus de Cantoblanco, 28049 Madrid, Spain.

^c Institute for Advanced Research in Chemical Sciences (IAdChem), 28049 Madrid, Spain.

Due to their exceptional structural and photophysical properties, such as pronounced absorption and/or emission in the UV-vis and near-infrared (NIR) spectrum, superior charge transport characteristics, and a broad chemical adaptability, **Subphthalocyanines (SubPcs; Figure 1a)** occupy a distinguished position among the most widely explored and versatile porphyrinoids [1]. These aromatic macrocycles, characterized by their distinctive non-planar structure, exhibit significant potential across various cutting-edge applications. These applications include the creation of polar superstructures, the development of thermotropic and lyotropic liquid crystals, the utilization as non-fullerene acceptors, and as materials for singlet fission.

Herein, we unveil pivotal aspects within SubPc chemistry that are ushering in a new era in the conception, synthesis, and utilization of these macrocycles [2]. We will elucidate how SubPcs can be harnessed in molecular photovoltaics, serving as materials for singlet fission, and explore their enantiopure versions in chiral technologies (Figure 1b-d) [3]. Additionally, we will present the synthesis and characterization of SubPc columnar materials and the on-surface synthesis approaches to construct 2D-Chiral Polymers.

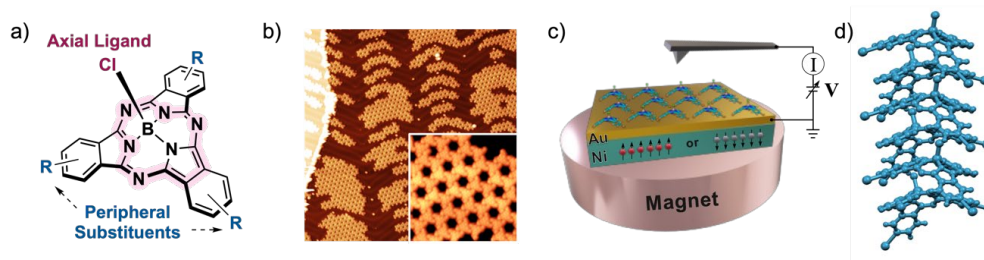


Figure 1. a) The molecular structure of SubPcs. b) An example of a self-organized network composed of SubPcs absorbed on Au (111). c) A SubPc-based spintronic device. d) A columnar array based on SubPcs interacting in a head-to-tail fashion at solid state.

REFERENCES

1. Lavarda, G.; Labella, J.; Martínez-Díaz, M. V.; Rodríguez Morgade, M. S.; Osuka, A.; Torres, T. *Chem. Soc. Rev.* **2022**, *51*, 9482-9619.
2. Labella, J.; Torres, T. *Trends in Chemistry* **2023**, *5*, 353-366.
3. Labella, J.; Kumar Bhowmick, D.; Kumar, A.; Naaman, R.; Torres, T. *Chem. Sci.* **2023**, *14*, 4273-4277.