# Electronic and magnetic properties of an on-surface synthesized 2D metal organic framework

**Amina Kimouche**[1]
Roberto Robles[2], Noemi Contreras[1], Daniel Ruiz[1], Aitor Mugarza[1,3]

[1] Catalan Institute of Nanoscience and Nanotechnology, Campus UAB Bellaterra 08193, Barcelona, Spain
[2] Centro de Física de Materiales CFM/MPC (CSIC-UPV/EHU), 20018 Donostia-San Sebastián, Spain
[3] ICREA Institució Catalana de Recerca i Estudis Avançats, Lluís Companys 23, E-08010 Barcelona, Spain
amina.kimouche@icn2.cat

Abstract

2D MOFs constitute a new class of designer materials where the coexistence of Dirac electrons and flat bands can lead to rich physical phenomena and to the realization of quantum phases such as topological or quantum anomalous Hall insulators (1). If the metal adatom additionally bears a non-zero spin, one obtains a Magnetic Topological Insulator, where the Quantum Anomalous Hall effect can emerge.

Following the concepts of coordination chemistry (2), based on a surface-assisted self-assembly of the metal and organic components, we have carried out synthesis of Iron-hexaiminotriphenylene (HITP) MOFs on Au(111) substrate and characterized their electronic structure using scanning tunnelling spectroscopy (STS). On the other hand, ab-initio calculations of the observed structures indicate the presence of strong ferromagnetic interactions that persist under the influence of the Au substrate, indicating that the interaction with the Au substrate stabilizes even further the FM state on $Fe_3(HITP)_2$. We relate such strong magnetic interactions to the formation of a radical spin at the ligand that mediate the inter-ionic interactions.

## References

[1] Z. F. Wang, Z. Liu, F. Liu, *Phys. Rev. Lett.* **110**, 196801 (2013)
[2] R. Zhang *et al.*, *Nanoscale*. **11**, 878–881 (2018)

## Figures

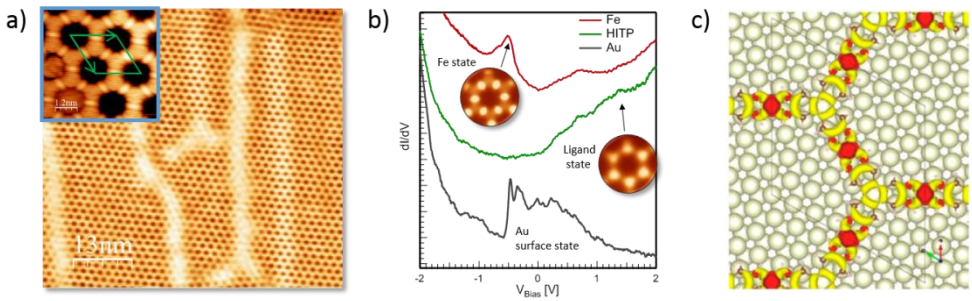


**Figure 1.** a) STM topographic images of $Fe_3(HITP)_2$ synthesized on Au(111). Arrows in the inset indicate the unit cell of the honeycomb structure. b) dI/dV spectra acquired at Fe and ligand sites, as well as on the clean Au surface. C) Spin density calculated for $Fe_3(HITP)_2$ on Au(111).