HELLENIC REPUBLIC
National and Kapodistrian University of Athens
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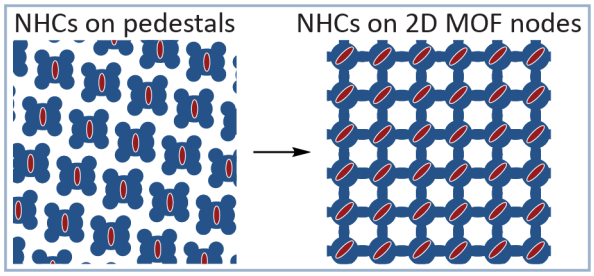
Two research positions (PhD/PostDoc) available in the Papageorgiou lab
"Carbenes to tune 2D surface metal-organic frameworks"

Field: Surface Science
Main techniques: Scanning probe microscopy, ultra high vacuum
Location: Chemistry department, National and Kapodistrian University of Athens
Funding: Hellenic Foundation for Research and Innovation (https://www.elidek.gr/en/homepage/)

Requirement: Applicants should hold a master's or doctoral degree in physics, chemistry, materials science or related engineering discipline and show a strong interest in experimental studies. We offer a dynamic, supportive environment for a candidate able to thrive in a team focused on the development and application of next-generation surface-based hybrid architectures.

Starting date: asap – positions open till filled
Application: send short CV + a one-page cover letter to a.c.papageorgiou@chem.uoa.gr

Topic: The project is designed to **innovate in surface science to impact catalysis, electronics and quantum technologies**. It is rooted in efforts to harness the extraordinary properties of N-heterocyclic carbenes (NHCs) in functional surface nanoarchitectures. NHCs are indeed outstanding ligands to most elements. Their exceptional potential in surface science is disruptive: NHCs impart stabilisation, are more robust anchors than even thiols and can be tethers for complex functionalisation. With atomic engineering of NHC surface arrangement, we can take control of the nanoarchitecture function.



So far, carbenes have been directly tethered to solid surfaces, allowing limited control of spacing and orientation. Shifting the paradigm, we direct the NHCs at defined chosen positions and open a realm of nanotechnological opportunities. Key to this approach are robust self-assembled surface nanoarchitectures used as substrates of NHC organometallic chemistry. Our recently published mounting and dismounting of NHCs on and off metalloporphyrin surface pedestals validates this breakthrough concept (see also related publications below). Based on these findings, we propose bottom-up strategies to apply **NHCs for the reversible functionalisation of 2D metal-organic frameworks**.

The researchers will use cutting-edge preparation techniques in **ultra-high vacuum and in situ advanced scanning probe microscopy in Athens** to dissect and manipulate with atomic precision the nanoarchitectures. They will also carry out complementary characterisations in **synchrotron facilities (e.g. Diamond Light Source, U.K., MAX IV, Sweden) and the partner laboratory in the Technical University of Munich** (http://www.e20.ph.tum.de).

Related publications of the team:

1. 'N heterocyclic carbenes: molecular porters of surface mounted Ru porphyrins' *Angew. Chem. Int. Edit.* 62 (2022) e202211877 https://doi.org/10.1002/anie.202211877
2. 'Conformational control of chemical reactivity for surface-confined Ru-porphyrins' *Angew. Chem. Int. Edit.* 60 (2021) 16561, https://doi.org/10.1002/anie.202104075 - Featured in the Diamond Light Source 2021/22 Annual Review
3. 'Assembly and manipulation of a prototypical N-heterocyclic carbene with a metalloporphyrin pedestal on a solid surface' *J. Am. Chem. Soc.*143 (2021) 4433 https://doi.org/10.1021/jacs.1c01229
4. 'On-surface synthesis of a semiconducting 2D metal-organic framework Cu3(C6O6) exhibiting dispersive electronic bands' *Angew. Chem. Int. Edit.* 59 (2020) 2669 https://doi.org/10.1002/anie.201913698 - Very Important Paper.
5. 'N-Heterocyclic carbenes on the close packed coinage metal surfaces: Bis-carbene metal adatom bonding scheme of monolayer films on Au, Ag and Cu' *Chem. Sci.* 8 (2017) 8301 https://doi.org/10.1039/c7sc03777e

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