



In collaboration with:



PhD Project: Dynamic control of reactivity in photoelectrochemical CO₂ conversion

Job type: PhD program under French National Agency (ANR) funding

Duration: 2023-2026 (36 months, starting Oct-Dec)

Location: Orsay, France (22 km from Paris)

Working Environment:

The Artificial Photosynthesis Group combines the expertise from two laboratories: Laboratory of Inorganic Chemistry (LCI) at University of Paris Saclay and Laboratory of Fundamental Mechanisms in Bioenergetics (LMB) at CEA Saclay. The group specializes in the development of bio-inspired catalysts for applications in light-induced CO₂ conversion in the context of artificial photosynthesis. We are experts in the synthesis of tailored homogeneous catalysts^[1-4] while applying a broad panel of spectroscopic and (spectro)-electrochemical techniques.^[5,6] The complementarity of the two laboratories have been proven efficient to investigate reaction mechanisms and bottlenecks to guide optimization of catalyst design. All necessary techniques for synthesis methods and spectroscopic characterizations are available in the group: NMR, MS, nanosecond laser flash photolysis, fluorimeter, UV-Vis, time-resolved infrared spectroscopy, (photo/electro)-catalysis set-up, and product quantification (GC, NMR, IC).

Project Description:

Project IMPULSE is an international collaboration between University of Paris Saclay (France), Helmholtz Zentrum Berlin (M. Mayer, Germany), Ulm University (T. Jacob, Germany), and Koç University (S. Kaya, Turkey) that takes advantage of complementary expertise to investigate dynamic processes happening at hybrid molecule-material interfaces for the photo-electrochemical (PEC) CO₂ conversion. It combines the high selectivity of molecular catalysts, the better stability and extended light absorption of semiconductors to advance device development in sunlight-driven chemistry.

Your Task:

- Synthesis and characterization of molecular catalysts
- (Photo-/Electro-)chemical characterization and catalysis
- Spectroscopic and spectro-electrochemical investigation (UV-Vis, IR, *etc.*)

Your Profile:

- Master's degree/diploma in chemistry, materials science, physics, chemical engineering, or similar field with at least one experience in the required tasks and willingness to learn the others.
- Good communication skills in English through written and oral presentations

Supervision: Prof. Ally Aukauloo (ICMMO/LCI, University Paris Saclay)

Co-supervision: Dr. Philipp Gotico (Institut Joliot/LMB, CEA Saclay)

Application (deadline July 16, 2023):

Send your CV (with contact information of two referees), and motivation letter (with brief summary of past research experiences) to philipp.gotico@cea.fr

References:

- [1] P. Gotico, Z. Halime, A. Aukauloo, *Dalton Trans.* **2020**, 49, 2381–2396.
- [2] P. Gotico, L. Roupnel, R. Guillot, M. Sircoglou, W. Leibl, Z. Halime, A. Aukauloo, *Angew. Chem. Int. Ed.* **2020**, 59, 22451–22455.
- [3] A. Khadhraoui, P. Gotico, W. Leibl, Z. Halime, A. Aukauloo, *ChemSusChem* **2021**, 14, 1308–1315.
- [4] C. Zhang, P. Gotico, R. Guillot, D. Dragoe, W. Leibl, Z. Halime, A. Aukauloo, *Angew. Chem. Int. Ed.* **2023**, 62, e202214665.
- [5] E. Pugliese, P. Gotico, I. Wehrung, B. Boitrel, A. Quaranta, M.-H. Ha-Thi, T. Pino, M. Sircoglou, W. Leibl, Z. Halime, A. Aukauloo, *Angew. Chem. Int. Ed.* **2022**, 61, e202117530.
- [6] P. Gotico, T.-T. Tran, A. Baron, B. Vauzeilles, C. Lefumeux, M.-H. Ha-Thi, T. Pino, Z. Halime, A. Quaranta, W. Leibl, A. Aukauloo, *ChemPhotoChem* **2021**, 5, 654–664.