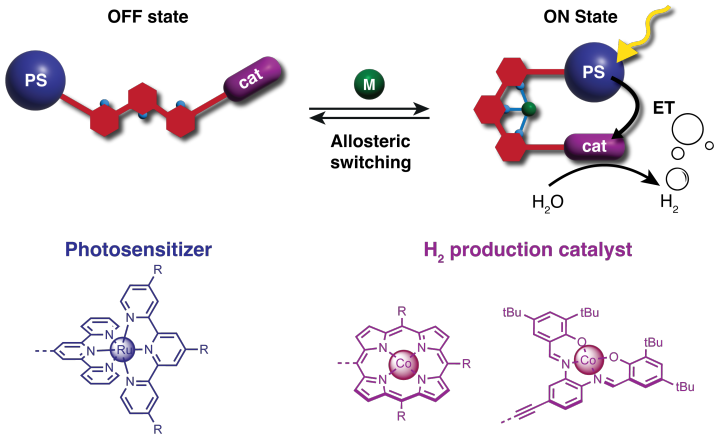
Joint PhD position Sorbonne Université, Paris & Université de Montréal, starting in October 2026

Allosteric Regulation of Photocatalysis by Molecular Tweezers

Supervision: Guillaume Vives (Sorbonne University, Paris), Garry Hanan (Université de Montréal)

Allosteric regulation is a mechanism widely exploited by natural systems to modulate activity through structural change. In photosynthesis, it helps balance energy flow and redox homeostasis inside the cells. This project aims to translate that principle into artificial photocatalytic assemblies to achieve adaptive light-driven hydrogen evolution reaction (HER), a promising strategy for sustainable energy production. Molecular machines, and particularly switchable molecular tweezers,[1] offer an attractive way to achieve such regulation by reversibly controlling the distance and orientation between functional units, thereby influencing energy and electron transfer processes.



The central objective of this doctoral project is to modulate the photocatalytic activity of hydrogen production by exploiting the mechanical motion of dissymmetric tweezers acting as a switchable catalytic platform. By combining the complementary expertise of the two groups, we aim to control HER either by (i) modulating the efficiency of intramolecular electron transfer from the photosensitizer to the catalytic center depending on whether the tweezers are in the open or closed form, or by (ii) directly modulating the activity of the catalytic center using an appended proton relay group, which is expected to enhance hydrogen production when brought into close proximity.

The project builds on preliminary results from both teams. The Paris group has developed coordination-responsive terpyridine-based molecular tweezers whose reversible motion has already been used to tune luminescent, magnetic, redox, and catalytic properties,[2] while the Montréal group has established robust photoactive metal complexes for long-lived hydrogen-evolving systems.[3] The project is supported by an active collaboration between the two groups, including shared student training and exchange opportunities, and is designed to provide the PhD candidate with complementary expertise in supramolecular chemistry and photoactive metal complexes.

Job description

The PhD candidate will work on molecular synthesis, switching studies, photophysical characterization, and photocatalytic evaluation. Synthesis and switching studies will be carried out in Paris, while detailed photophysical and photocatalytic studies will be conducted in Montréal.

Desired skills

We are looking for a student with a master degree in molecular chemistry with a solid experience in organic synthesis and supramolecular chemistry. An interest in photophysical methods would be appreciated.

Application

The application is open until **20 April 2026**. Applicants should send a CV, a cover letter, academic transcripts, and contact details for references to guillaume.vives@sorbonne-universite.fr and garry.hanan@umontreal.ca. **The selected candidate will participate in the competitive selection process of Sorbonne University international program.**

[1] P. Msellem, M. Dekthiarenko, N. Hadj Seyd, G. Vives, *Beilstein J. Org. Chem.* **2024**, *20*, 504-539.

[2] a) B. Doistau, L. Benda, J. L. Cantin, L. M. Chamoreau, E. Ruiz, V. Marvaud, B. Hasenknopf, G. Vives, *J. Am. Chem. Soc.* **2017**, *139*, 9213-9220; b) L. Benda, B. Doistau, C. Rossi-Gendron, L.-M. Chamoreau, B. Hasenknopf, G. Vives, *Commun. Chem.* **2019**, *2*, 144; c) P. Msellem, G. Groslambert, L. Miton, M. Pomes-Hadda, N. J. Van Zee, C. Guibert, G. Vives, *J. Am. Chem. Soc.* **2025**, *147*, 5360.

[3] a) G. M. Mercier, E. Rousset, I. Oubaha, K. Bandyopadhyay, A. K. Pal, I. Ciofini, L.-M. Chamoreau, V. Marvaud, G. S. Hanan, *Chem. Commun.* **2025**, *61*, 14911-14914; b) I. Oubaha, E. Dray, E. Rousset, K. Bandyopadhyay, A. K. Pal, I. Ciofini, G. Mercier, V. Marvaud, G. S. Hanan, **2026**, *submitted for publication.*