

Postdoctoral Position at CEA-Saclay Institute JOLIOT

Synthesis and Characterization of Photoswitches for Photo-Induced Carbon Dioxide Capture and Release

Laboratory: JOLIOT/LMB, I2BC/PPP ([website 1](#), [website 2](#))

Discipline: Organic Chemistry, Spectrochemistry, Photochemistry

Duration: 24 months (start as soon as position is filled)

Benefits: Competitive salary package and benefits from CEA Saclay ([CEA website](#))

Location: Saclay, France (22 km from Paris)

Context and work environment:

The Laboratory of Fundamental Mechanisms in Bioenergetics (LMB) at CEA Saclay is an interdisciplinary team of chemists, photophysicists, and biologists dedicated to exploring photo-induced processes in biological and bio-inspired systems that harness photon energy to drive chemical reactions. In the field of artificial photosynthesis, we focus on designing bio-inspired catalysts for light-driven CO₂ conversion. Our expertise lies in employing a comprehensive array of spectroscopic techniques (both steady-state and time-resolved) and (spectro)-electrochemical methods to unravel reaction mechanisms and identify bottlenecks, providing critical insights for optimizing and tailoring catalyst designs.

This postdoctoral position is part of the nationwide **AirCapture** project, under the CEA *Audace* program and coordinated by Dr. Vincent Artero, which seeks to pioneer innovative strategies for capturing and converting atmospheric carbon dioxide. The successful candidate will be part of the team to develop a groundbreaking approach for the direct conversion of CO₂ within capture solvents. This bold initiative aims to overcome the economic barriers currently hindering global adoption of CCU technologies, which are largely driven by the high energy and capital costs associated with post-processing capture solvents.

Main activities: This project bridges synthetic and physical chemistry to advance CO₂ capture and conversion technologies. The postdoc will design and synthesize photoacids based on merocyanine-spiropyran metastable photoswitches. The project will involve screening functional groups to optimize the ground and excited-state pK_a values, enabling efficient CO₂ release from bicarbonates and carbamates—the chemisorbed forms of CO₂ in capture solvents. The ideal photoacids will have ground-state pK_a values high enough to prevent deprotonation in the dark, while their excited-state pK_a must be low enough to effectively protonate carbonaceous species. Time-resolved, pH-dependent spectroscopic techniques will be employed to monitor pH fluctuations, optimizing the ΔpH response, reaction rate, and reversibility. A library of established electrocatalysts will be tested in industry-relevant amine-based capture solvents under controlled dilution conditions to assess changes in electrochemical performance. The synthesized photoacids will then be applied to enhance electrocatalytic performance, enabling photo-triggered external control to synchronize the rates of CO₂ release, capture, and conversion. Emphasis will be placed on scalable and sustainable synthetic pathways to facilitate seamless integration with other work packages within the consortium.

Desired profile: The ideal candidate will hold a PhD in chemistry and demonstrate a strong interest in multidisciplinary research, particularly in the fields of energy and CO₂ conversion. A strong background in organic/inorganic chemistry, photochemistry, and/or (electro/photo/photoelectro)-catalysis is important. Prior experience in the synthesis and characterization of photoswitches would be a valuable asset. The candidate should be capable of working independently in a chemistry laboratory and show enthusiasm for advancing renewable energy technologies. Excellent verbal and written communication skills are required. We seek motivated and creative individuals who can collaborate effectively with team members and external partners within the network. We are committed to supporting and encouraging the successful candidate to develop their project to its fullest potential, fostering an environment that promotes innovation and excellence.

How to apply: Only applications that match the job description will be considered. Applications (CV + letter of motivation + letters of recommendation) should be sent to Philipp GOTICO (philipp.gotico@cea.fr).