

Electrifying the synthesis of organic compounds: *Metallacycles - electrochemical access, characterization and catalysis*

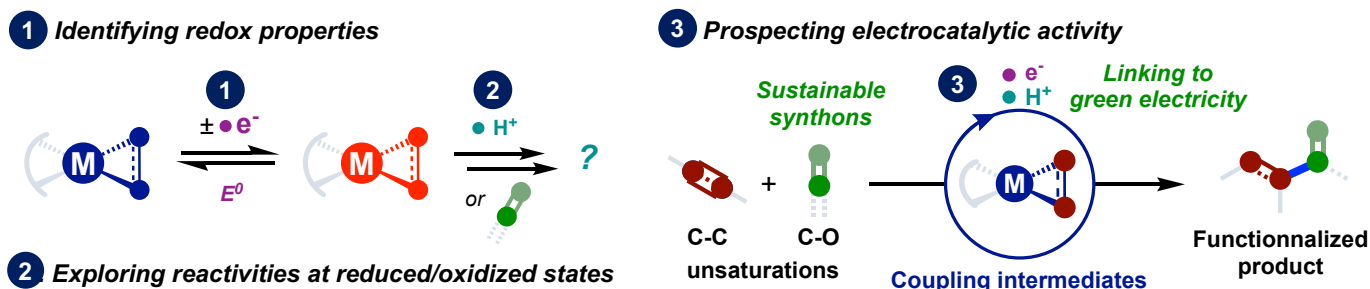
Keywords: molecular electrochemistry, organometallic catalysis, carbon circular economy, renewables.

Topic

To shift from fossil-based to sustainable resources in chemical production, the wiring of synthetic pathways with renewable electricity offers a promising approach. This paradigm introduces electrosynthesis (i.e. the creation of chemical bonds using electricity) as a key technology. The reach of this technology pends on the development of efficient catalysts adapted to electrosynthetic conditions – *electrocatalysts*. In this context, our team is developing original approach to deploy electrocatalysis in synthesis.

In this PhD project, we will study the **electrochemistry of organometallic metallacycles** – key intermediates in molecular catalysis – and exploit them in **electrocatalytic coupling reactions**. The **electrochemical generation and characterisation of metallacycles** will first be studied and the impact of redox changes on the reactivity of these metallacycles subsequently investigated. Finally, building on these concepts, the metallacycles will be employed in electrocatalytic reductive **C–C couplings**, such as those between unsaturated compounds like alkynes/alkenes and aldehydes/ketones. The project capitalizes on strategies previously described by the team and takes an interdisciplinary approach involving molecular synthesis and characterizations, electrochemical studies, mechanistic investigations and electrosynthesis.

Key references N. Kaeffer, W. Leitner, *JACS Au* **2022**, 2, 1266.
G. Durin, M. Y. Lee, M. A. Pogany, T. Weyhermuller, N. Kaeffer, W. Leitner, *J. Am. Chem. Soc.* **2023**, 145, 17103.
G. Durin, M. Lee, M. A. Pogany, C. Kahl, T. Weyhermuller, W. Leitner, N. Kaeffer, *Chem. Commun.* **2025**, 61, 520.



Candidate's profile

- MSc degree (or equivalent) in chemistry.
- Excellent knowledge and skills in molecular chemistry (organic, organometallic) in terms of synthesis, characterization and properties (reactivity, physicochemical properties).
- Proficiency in chemical handling under inert atmosphere.
- Interest or experience in electrochemistry.
- Scientific rigor in practice, analysis and reporting.
- Proactivity and team-work.

Skills and knowledge developed

- **Molecular synthesis** (organic, coordination complexes) and identification methods (NMR, GC, MS).
- Reactivity of **organometallic** species.
- **Electrochemistry** of molecular compounds (voltammetry, electrolysis, spectro-electrochemistry).
- Formatting and presentation of results in conferences and scientific articles.
- Project work and scientific collaborations.

Funding: 3-year fully-funded PhD position

Location: Strasbourg, France (Cronenbourg Campus)

Supervision: Dr. Nicolas Kaeffer

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Host: Team MeCSE ([Molecular ElectroCatalysis for Synthesis and Energy](#)) within LIMA - UMR 7042

Deadline for application: 23/10/2026

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