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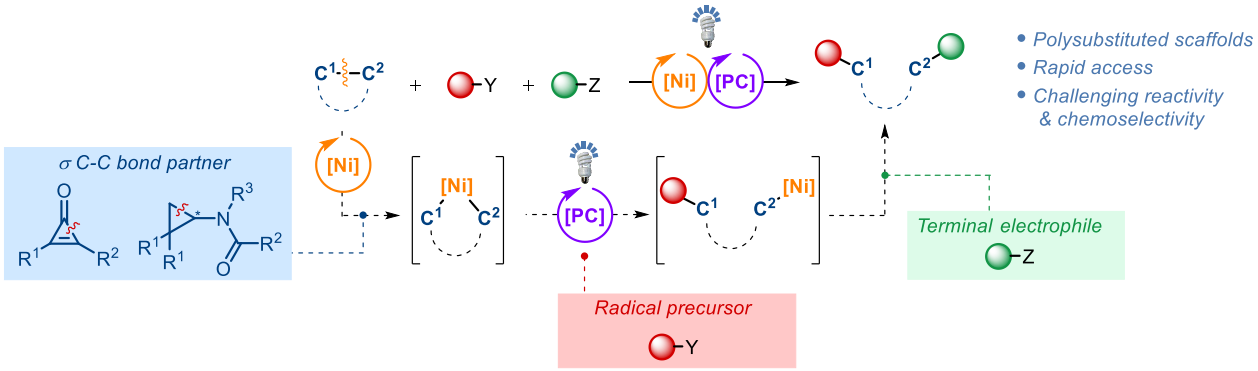
PhD position in dual metallaphotoredox catalysis-ANR Grant

Difunctionalizations of σ C–C bonds by Dual Nickel/Photoredox Catalysis

Position details: Fully funded PhD position for 3 years in organic synthesis/catalysis under the supervision of Dr. G. Tran and Prof. A. Amgoune, in the team SCORE (ICBMS, Lyon 1). Open to applicants from all nationalities. Starting date: October 2023.

Scientific context: A major challenge in modern organic chemistry lies in diminishing the environmental footprint of complex molecule synthesis. In this context, direct functionalization of common organic molecules has attracted considerable attention in the last decades. More specifically, the activation and functionalization of ubiquitous σ carbon-carbon bonds offer considerable perspectives in organic synthesis. Indeed, this strategy would permit the direct reorganization/functionalization of simple molecular backbones, thus circumventing costly functional group manipulations.[1] Despite this tremendous potential, the difunctionalization of σ C–C bonds by transition metal catalysis remains a largely underexplored transformation due to significant challenges in terms of reactivity and selectivity.

Project goals: *This project will aim to explore a dual nickel/photoredox catalytic system in the field of σ C-C bonds functionalization.*[2] On one hand, nickel catalysis will allow activation of the σ C-C bonds; and on the other hand, photoredox catalysis ([PC]) will be used to activate reagents *in situ* as free radical species and to modulate the [Ni] oxidation state, thus ensuring the chemoselectivity of the sequence. The development of these novel difunctionalization reactions should enable the design of entirely novel reaction sequences in the field of σ C-C bonds functionalization and significantly streamline the synthesis of several families of complex molecules.
This project will be carried out using a multi-disciplinary approach involving reaction development, catalyst design, organometallic synthesis and mechanistic studies.



Candidate: The applicant should hold a master degree in organic/molecular chemistry and be able to demonstrate a strong interest in all aspects of catalysis. Enthusiasm, autonomy, scientific curiosity and ability to communicate are required qualities. A previous experience in organometallic catalysis and/or photochemistry would be appreciated but is not mandatory. Interested applicants should send a cover letter (1 page), CV, M2 grade sheets and contact details of referents to gael.tran@univ-lyon1.fr and abderrahmane.amgoune@univ-lyon1.fr.

[1] For a selection of recent reviews, see: a) Chen, P-H.; Billet, B. A.; Tsukamoto, T.; Dong, G. *ACS Catal.* **2017**, *7*, 1340. b) Fumagalli, G.; Stanton, S.; Bower, J. F. *Chem. Rev.* **2017**, 117, 9404.
[2] Chan, A. Y.; Perry, I. B.; Bissonnette, N. B.; Buksh, B. F.; Edwards, G. A.; Frye, L. I.; Garry, O. L.; Lavagnino, M. N.; Li, B. X.; Liang, Y.; Mao, E.; Millet, A.; Oakley, J. V.; Reed, N. L.; Sakai, H. A.; Seath, C. P.; MacMillan, D. W. C. *Chem. Rev.* **2021**, *122*, 1485.