

Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Couve-Bonnaire Given names : Samuel

Status (prof., assistant prof., ...) : Professor

Laboratory : CARMen - UMR 6064 Website address : <http://www.lab-cobra.fr>

Institution : Institut National des Sciences Appliquées - Rouen Website address : <https://www.insa-rouen.fr/recherche/laboratoires/carmen>

Scientific competence of the supervisor:

Our research group is interested in the development of new methodologies for the construction of relevant synthetic building blocks by using reemerging technologies such as electrochemistry, photochemistry and mechanochemistry. In that context, we mainly focus on the design of synthetic strategies to obtain value-added organic molecules, while lowering environmental impact of organic synthesis for production of chemicals. Since the last 5 years, we have devoted lots of efforts to develop new synthetic strategies using mechanochemistry, which enable removing solvents from synthesis to minimized environmental impact of drug production.

Two major publications in the field proposed for the PhD :

1. « Ball-Milling Assisted Synthesis of Monofluoroalkenes ». He, C.; Barreto, S.; Solomin, V.; Dubouilh-Bernard, C.; Couve-Bonnaire, S.; Bouillon, J.-P. and Castanheiro, T. Chem. Eur. J. 2025, e202500458
2. "Ball-Milling Assisted Iron-Catalyzed Difluoromethylation Toward the Synthesis of Valuable Oxindoles" Solomin, V.; Delcroix, N.; Caldiero, M.; Jubault, P. and Castanheiro, T., ChemSusChem, 2025, 18, e202501319.

Website address of the personal page : <https://www.insa-rouen.fr/recherche>

Supervisor's email : samuel.couve-bonnaire@insa-rouen.fr

Description of the research work proposed for a PhD Topic # (see list) : II-13

Title : Mechanochemical processes for the development of synthetic methodologies

Subject :

Although mechanochemistry has been known for centuries, its application have long been confined to inorganic synthesis and materials science. Only in recent years have organic chemists begun to exploit this technology, primarily as a means to eliminate solvent use in synthetic methodologies, thereby aligning with several of the twelve principles of green chemistry. The reliance on solvents is recognized as environmentally deleterious due to their origin from fossil resources as well as the energy-intensive processes required for their production, purification, recycling and storage. Replacing solvents with mechanical energy not only improves the sustainability profile of chemical processes but leads to shorter reaction times, enhanced reactivity and selectivity, and enables the use of reagents that are poorly soluble in organic solvents. There is a clear need to develop new synthetic strategies that enable access to value-added organic molecules while addressing the sustainability challenges of the 21st century. In this proposal, we aim to develop new mechanochemical synthetic pathways for the preparation of fluorinated molecules, which are nowadays molecules of particular importance in medicinal chemistry or agrochemistry, for instance. In particular, the generation and reactivity study of radical and carbene intermediates under solvent-free conditions will constitute a central focus of the proposed PhD work. To support this research program, we seek an outstanding and highly motivated candidate.

Keywords :

Synthetic methodologies, Organofluorine chemistry, Mechanochemistry, Sustainable chemistry

Expected collaborations :

no collaborations are expected

Background required from the applicant :

A Master degree in Organic Chemistry, good knowledge of the analytical methods (NMR, MS...)

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

(see guidelines on the website www-csc.utt.fr)