

## Ph.D. Position

### Subject: Mechanochemistry for the Resolution of Chiral Molecules (CHIROMECA)

#### General information:

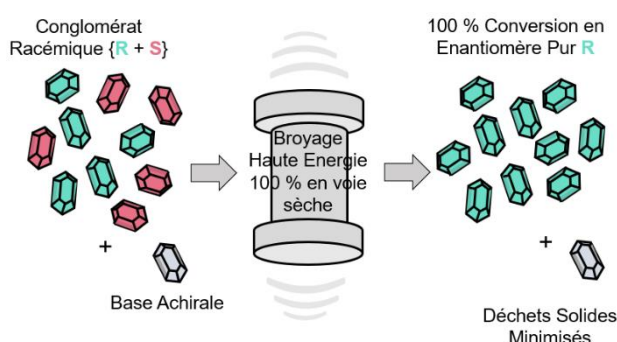
- **Location:** Rouen, France
- **Affiliated laboratory:** Separative Sciences and Methods (UR 3233)
- **Research team:** Crystallogenes
- **Contract type:** PhD thesis in Materials Chemistry
- **Affiliated doctoral school:** Physics, Engineering Sciences, Materials and Energy (PSIME – ED No. 591)
- **Funding body:** Normandy Region
- **Duration:** 36 months
- **Start date:** October 2026
- **Salary:** €2,300 gross per month
- **Required educational background:** Master's or engineering degree in chemistry. Key profile keywords: crystallised molecular materials, mechanochemistry, organic chemistry, crystallisation, solid-state chemistry.

#### Scientific Background of the Thesis

Many industrial sectors, including pharmaceuticals, cosmetics and food, face major challenges in process development due to growing environmental and energy constraints. Chemistry must now evolve towards more efficient and sustainable methods. In this context, mechanochemistry emerges as a promising alternative to solution-based processes. It accelerates chemical transformations and creates new solid phases using high-energy mills with little to no solvent.

Recently, our team successfully achieved deracemization via mechanochemistry for the first time, producing a pure enantiomer from a racemic mixture [1]. This approach is up to a hundred times faster than conventional solution-based methods such as Viedma ripening.

These results form the basis of the CHIROMECA project, which aims to develop and understand this new mechanochemical deracemisation process. The project seeks to establish mechanochemistry as a novel method for producing pure enantiomers in the solid state.



The main objectives of the thesis work are as follows:

- To better understand the mechanisms of racemisation and deracemisation during grinding using a multi-experimental approach.
- To apply these concepts to the enantioconversion of amino acids or other chiral molecules with high technological potential.
- To explore the feasibility of the process on a larger scale, with a view to industrial applications.

### Bibliography :

[1] Lopes, Chrystal, et al. "A greener pathway to enantiopurity: mechanochemical deracemization through abrasive grinding." *Chemistry—A European Journal* 29.35 (2023): e202300585.

[2] Noorduin, W. L.; Van Enckevort, W. J. P.; Meeke, H.; Kaptein, B.; Kellogg, R. M.; Tully, J. C.; McBride, J. M.; Vlieg, E. The Driving Mechanism behind Attrition-Enhanced Deracemization. *Angew. Chem., Int. Ed.* 2010, 49 (45), 8435–8438

[3] <https://theses.fr/2025NORMR074>

### Other publications of the team on the subject

- Lopes, Chrystal, et al. "Efficient racemization of the pharmaceutical compound Levetiracetam using solvent-free mechanochemistry." *RSC Mechanochemistry* 2.1 (2025): 83-90.
- Pinetre et al. Shaking things up: exploiting the potential of mechanochemistry to enhance deracemization of racemic compounds, *Chem Comm*, 2026, just accepted
- Job Gieling, Guillaume Wéry, Chrystal Lopes, Joséphine de Meester, Clément Brandel, et al.. Mechanochemical Deracemization: A Sustainable Approach to Enantiopurity. *Chemistry - A European Journal*, 2025, (10.1002/chem.202404120)

### Qualifications

The candidate must have:

- A master's degree or engineering degree in chemistry, preferably with a specialization in molecular materials, or any other master's degree in chemistry relevant to the proposed research topic.
- Scientific expertise in the characterization of solid materials and/or organic synthesis and/or mechanochemistry. Knowledge of analytical techniques for organic molecules (chromatography, NMR, infrared, etc.) would also be appreciated.
- A strong interest in independent experimental work in the laboratory.
- The ability to write scientific report.
- An interest in scientific communication.

### Work environment

The thesis will be conducted at the SMS laboratory at the University of Rouen, within a research team recognized for its work on enantiomeric purification via crystallization. This work follows a previous thesis in mechanochemistry that launched this highly promising research topic, which is recognized at the European level. As part of this work, travel may be required for visits to research partners.

### Documents to be included in the application package

- A resume highlighting your academic background and previous research experience
- Transcripts from your first and second years of master's studies (including the third semester) or from your engineering school, along with a detailed list of courses taken during your second year of master's studies.
- A one-page summary in English of your research experience gained during your studies (including internships).
- A personal statement in French or English (maximum one page) demonstrating how your profile aligns with the proposed research topic.
- Letters of recommendation from individuals who have supervised the candidate in teaching (e.g., M2 program directors) or research (supervisors of past or current internships).
- A list of contacts and potential references to provide further insight into the candidate's profile.

### Recruitment Process:

- Selection of a few candidates for a video interview
- Followed by the selection of two candidates for a second interview or to come in the lab to meet the management team and see the work environment.

**Application deadline for the PhD position:** May 30, 2026

### Supervising team (contacts)

Prof. Yohann CARTIGNY (thesis advisor): [yohann.cartigny@univ-rouen.fr](mailto:yohann.cartigny@univ-rouen.fr)

Dr. Clément BRANDEL (co-supervisor): [clement.brandel@univ-rouen.fr](mailto:clement.brandel@univ-rouen.fr)

SMS Laboratory website: [www.labsms.univ-rouen.fr](http://www.labsms.univ-rouen.fr)