

# New Methods in Mechanochemical Organic Synthesis

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## Summary

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*The PhD project is devoted to expanding the available synthetic portfolio of mechanochemical organic reactions, aiming to solve long-standing challenges of traditional solvent-based approaches by leveraging mechanochemical methods. The project will also focus on elucidating the driving forces in mechanochemical reactions and outlining their mechanisms, based on mechanistic experiments, kinetics measurements, reactivity trends, and stereochemical studies. The developed approaches will be applied to the preparation of bioactive compounds, pharmaceuticals, functional materials, and macrocyclic cavitands for supramolecular chemistry. Analysis of green chemistry metrics will be performed to ensure the sustainable, safe, and environmentally benign nature of the developed protocols.*

Research field:	Chemistry and biotechnology
Supervisors:	Prof. Dr. Riina Aav Dr. Dzmitry Kananovich
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between June 01, 2024 00:00 and June 30, 2024 23:59 (Europe/Zurich)

## Description

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We are seeking a highly motivated PhD student to join our team and contribute to the development of innovative mechanochemical methods for organic synthesis. The PhD project is devoted to expanding the available synthetic portfolio of mechanochemical organic reactions, aiming to solve long-standing challenges of traditional solvent-based approaches by leveraging mechanochemical methods. We aim to uncover the hidden reactivity of inorganic materials in reactions with organic compounds, potentially leading to the discovery of unprecedented transformations. The reactions will be performed in shaker and planetary mills by grinding solid components with the addition of a few drops of solvents as liquid additives to assist grinding.

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Experimental work will be conducted in chemistry research lab equipped with planetary and mixer mills, and suitable for organic synthesis, also access to various chemical analysis methods (like NMR, HPLC, MS, IR, UV, FS, CD, VCD, SC-XRD and PXRD) is available in the group. The PhD student will be supported by Department of Chemistry and Biotechnology and grant of PI (PRG2169)

### *Responsibilities and (foreseen) tasks*

Development of new mechanochemical methods for organic synthesis. Screening of reaction conditions, analyzing the composition of reaction mixtures, isolating, purifying, and characterizing synthesized compounds. Discussing results, generating new ideas, and suggesting improvements. Preparing scientific articles and presentations for weekly group meetings, scientific seminars, and international conferences. Supervising undergraduate students in the research lab.

*Applicants should fulfil the following requirements:*

- a master's degree or equivalent in organic or metalorganic chemistry or in relevant field.
- Strong knowledge of organic synthesis and NMR spectroscopy
- a clear interest in the topic of the position
- excellent command of English
- strong and demonstrable writing and analytical skills

- capacity to work both as an independent researcher and as part of an international team
- capacity and willingness to provide assistance in organizational tasks relevant to the project

*The following experience is beneficial:*

- knowledge of other modern analytic and spectroscopic techniques with the relevance to organic synthesis.

The candidate should submit a research plan for the topic, including the overall research and data collection strategy. The candidate can expand on the listed research questions and tasks, and propose theoretical lenses to be used.

*We offer:*

- 4-year PhD position with salary starting from 2300 euros in very strong research group
- The chance to do high-level research in very attractive research field
- Opportunities for conference visits, research stays and networking with globally leading universities and research centers

*About the department*

The **department of Chemistry and Biotechnology** is divided to three Divisions. The main research areas of Division of Chemistry include analytical, computational, industrial, organic, supramolecular, and wood chemistry. The Division of Chemistry is responsible for education in these fields at the bachelor's, master's, and doctoral levels, thus ensuring the ongoing cultivation of proficient specialists in chemistry. In our research and teaching, we put emphasis on the development and implementation of sustainable and green thinking.

The research and teaching facilities at the Division of Chemistry are furnished with modern equipment, supporting high-level research and education. A total of 10 research groups operates within our division, with approximately 80 academic staff members, including 4 professors and 25 doctoral students. Our researchers are engaged in international networks and cooperations, making their research worldwide visible.

**Supramolecular Chemistry research group, lead by Riina Aav**, is focusing on intermolecular interactions in order to understand complex systems of molecules and find greener approaches in chemistry. We are developing sustainable synthetic methods and designing new chiral supramolecular receptors for sensing chirality and chiral separation. We are also looking for methods to recycle and valorize waste in order to decrease pollution.

*(Additional information)*

For further information, please contact Prof Riina Aav [riina.aav@taltech.ee](mailto:riina.aav@taltech.ee) and Dr. Dzmitry Kananovich [dzmitry.kananovich@taltech.ee](mailto:dzmitry.kananovich@taltech.ee) or visit <https://riinaaav.wixsite.com/grouppage/group-news>



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