Green Chemistry TechHub – A Trilateral Doctoral Program

The Green Chemistry TechHub is a joint doctoral training program established by TU Wien (TUW), the University of Natural Resources and Life Sciences (BOKU), and the University of Vienna (UV). Funded by the Austrian Research Promotion Agency (FFG) and supported by a robust network of industry partners, the program is dedicated to advancing innovation in sustainable and environmentally responsible chemistry through interdisciplinary research and academic–industry collaboration.

We are currently offering 8 fully-funded PhD positions across the three institutions:

- 4 Positions at TU Wien (TUW)
- 2 Positions at BOKU University (BOKU)
- 2 Positions at University of Vienna (UV)

Each doctoral researcher will engage in a four-year research program, spending **up to 3 years at the academic institution** and **1 year embedded with an industry partner or continued employment at the academic institution with a secondment placement at industry**, gaining valuable cross-sector experience in applied green chemistry and biotechnology. The positions are equivalent to part-time university assistantships (30 hours/week) and offer competitive remuneration according to FFG guidelines and the respective university's pay scale, including full social benefits.

We offer:

- An interdisciplinary, applied research setting within the **Green Chemistry TechHub**
- Exposure to both academic excellence and real-world industrial challenges
- Hands-on experience with advanced tools and methodologies in sustainable biotechnology
- Competitive funding and access to professional development resources
- Diverse and cutting-edge research projects
- Continuing personal and professional education
- Additional optional training as a Green Chemistry Change Manager (GCCM)
- High-quality supervision by renowned scientists
- Ample opportunities for international networking, secondments, and research collaboration
- Courses on transferable skills
- Comprehensive social benefits (e.g., health insurance)
- Administrative support in study and organizational questions
- A central location in Vienna—consistently ranked as the city with the best quality of life
- A dynamic and inclusive working environment

Applications:

Application Process: Applications will be reviewed on a rolling basis until the position is filled.

At the Green Chemistry TechHub consortium we are committed to equal opportunity and strive to increase the representation of women within scientific staff across all partner institutions. Therefore, we strongly encourage qualified women to apply. Female applicants will be given preferential consideration when their qualifications, aptitude, and professional performance are comparable to those of male applicants. Additionally, persons with disabilities are especially encouraged to apply.

Applications should be submitted online via the TU Wien job portal.

Required Documents:

- A **cover letter** listing three preferred PhD topics from the project list (ranked with motivation)
- A **curriculum vitae**, including publications, conference contributions, and other scientific activities (if applicable), preferably using the Europass template
- A **one-page summary** of the diploma/master's thesis
- **Transcripts** of records of the Bachelor- and Master-studies
- A **one-page outline** on how you would approach the proposed project

Selection Process:

Shortlisted candidates will be invited to participate in a **video or face-to-face hearings**, which will include:

- A presentation on previous research projects
- A short discussion of a thematically related publication (article sent one week in advance)
- A critical reflection on the proposed implementation of the selected project

This multi-stage process ensures a comprehensive evaluation of technical expertise, strategic thinking, and alignment with project objectives.
For further information about the open positions or the application procedure, please contact the Project Manager, Muhammad Farooq Zia (muhammad.zia@tuwien.ac.at), or reach out to one of the project leaders.

Positions (English):

Position 1. Biotechnological methanol valorization (BOKU/New Path Bio)
Position 2. Production of biochemicals based on biodiesel and bioethanol waste (BOKU/Vogelbusch)
Position 3. Membrane separation process for CO_2 (TUW/VOESTalpine)
Position 4. Sustainable polymer processing (UV/BASF)
Position 5. Starch modification (TUW/Agrana)
Position 6. Sustainable isotope labeling (UV/Boehringer Ingelheim)
Position 7. Solvent-free reaction cascades using mechanochemistry (TUW/RDP)
Position 8: Development of a modular polysaccharide platform using click chemistry (TUW/Agrana)

Positions (German):

Position 1: Biotechnologische Methanol Valorisierung (BOKU/New Path Bio)
Position 2: Lentilactobacillus Plattform (BOKU/Vogelbusch)
Position 3: Membranseparationsprozess für CO_2 (TUW/VOESTalpine)
Position 4: Nachhaltige Polymer-Prozessierung (UV/BASF)
Position 5: Stärkemodifikation (TUW/Agrana)
Position 6: Nachhaltiges Isotopenlabelling (UV/Boehringer Ingelheim)
Position 7: Lösungsmittelfreie Reaktionskaskaden mittels Mechanochemie (TUW/RDP)
Position 8: Modulare Polysaccharid-Platform mittels Click Chemie (TUW/Agrana)

Position 7:

Solvent-free reaction cascades using mechanochemistry

The largest amount of material in a chemical reaction is usually the solvent, which has to be considered as waste in most cases. Hence, there is an ongoing trend to use “green solvents” considered as more environmentally benign.[i] Still, the best solvent is no solvent, since no waste is generated, and even if a solvent can be recycled, the energy, time, and materials required for recycling can be omitted.

In this regard, mechanochemical synthesis,[iia] e.g. performing reactions in ball mills or planetary mills, has regained attention in organic synthesis (Figure 1), and we have contributed to this field as well.[iib,c] What is still required of course are solvents for work-up procedures and isolation, which often contribute more solvent waste to a process than the reaction solvent itself. Hence, it has to be the goal to reduce the amount of solvents in these steps as well. One option is to develop methods for isolation which require less solvents, the other is **to reduce the number of workup and isolation steps in synthetic sequences**. It is this latter option where the present proposal is located and mechanochemical synthesis can demonstrate its strength.

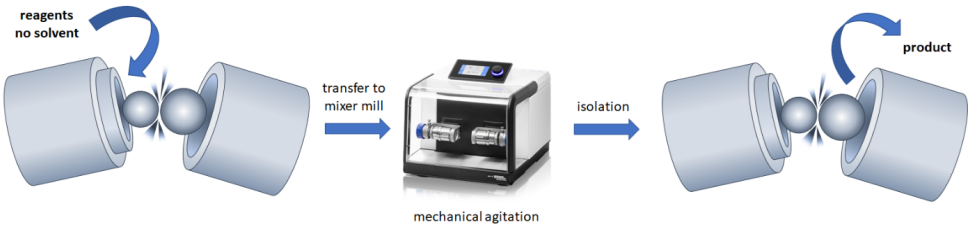

Figure 1: General principle of mechanochemical synthesis

The aim is, to carry out reaction cascades under solvent-free conditions, without isolation and purification of intermediate products. In the first step of a sequence, the reagents are added to a milling vessel and the reaction is typically carried out in a ball mill. After the first transformation, the milling vessel is opened, and the additional reagents for the next step are added (Figure 2). Ideally, multi-step syntheses can be carried out without isolation and purification of any intermediate and only the final product is isolated.

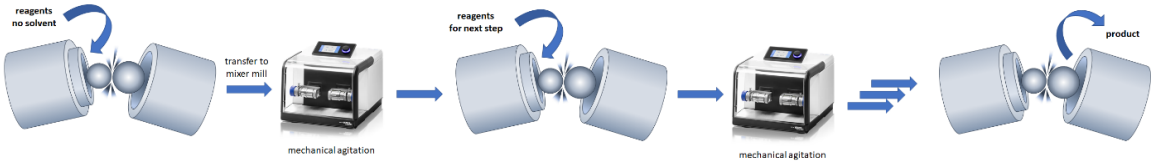

Figure 2: Illustration of mechanochemical reaction sequences

Furthermore, mechanochemical methods will be combined with other emerging technologies such as photo(redox)chemistry.

The potential of such cascades will be demonstrated on the synthesis of pharmaceutically relevant compounds.

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[i] Clarke, C.J.; Tu, W.-C.; Levers, O.; Bröhl, A.; Hallett, J. P. *Chem. Rev*. **2018**, *118*, 747–800; 10.1021/acs.chemrev.7b00571

[ii] a) Do, J.-L., Friščić, T. *ACS Cent. Sci*. **2017**, *3*, 13–19. 10.1021/acscentsci.6b00277. b) Templ, J., Schnürch M. *Angew. Chem. Int. Ed*., **2024**, *63*, e202314637 10.1002/anie.202314637. c) Templ, J., Schnürch M., *ChemRXiv* (and recently the revisions have been submitted to *Angewandte Chemie*) 10.26434/chemrxiv-2024-wpz3z-v2