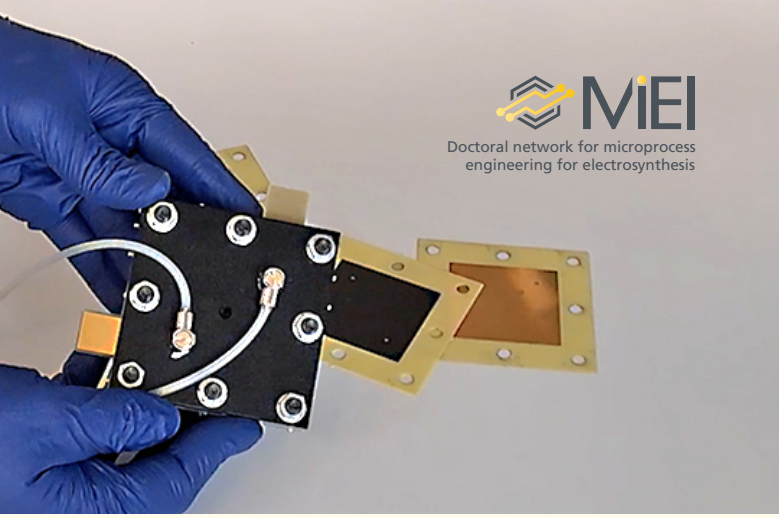

MiEl

Doctoral network for microprocess engineering for electrosynthesis

Cell Development

MiEl is a research and training project funded by the European Union's Marie-Sklodowska-Curie program. The project aims to develop a synthesis technology for the chemical industry of the 21st century by combining the advantages of electrochemistry, micro process engineering and fluid chemistry.

A team of five doctoral candidates is working on the development and simulation of integrated electro-chemical cells using a combination of sensor and printed circuit board technologies. The advantages of PCB technologies are that they are cost-effective and highly industrialized. In addition, sensors for better process control can be directly integrated.

www.project-miel.eu

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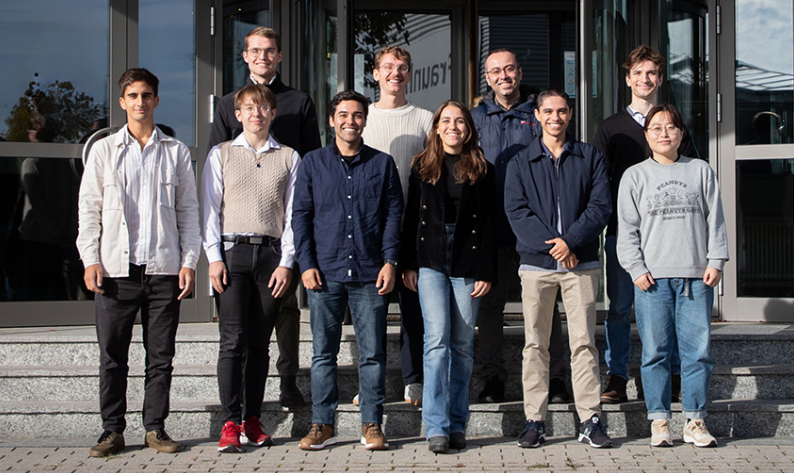
Duration: 1.1.2023 – 31.12.2026



Doctoral candidates at the first project meeting.

Partnership in MiEl

Coordinated by the Fraunhofer Institute for Chemical Technology in Germany, MiEl involves partners and associated partners from 9 different countries, who have recruited 12 doctoral candidates for the project.

- Fraunhofer ICT – Germany
- University of Amsterdam – The Netherlands
- Technical University of Denmark – Denmark
- University for Continuing Education Krems – Austria
- UCT Prague – Czech Republic
- Sorbonne Université – France
- Innoverda – France
- eChemicles – Hungary
- Johnson & Johnson – Belgium
- ZHAW – Switzerland

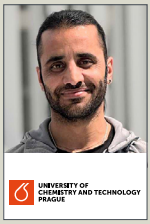
Associated partners in MiEl

- Karlsruhe Institute of Technology
- Johannes Kepler Universität Linz
- University of Szeged
- Golin Wissenschaftsmanagement

Doctoral candidates working on cell development

Mohammad Derakhshani is working on the development of electrochemical flow cells using printed circuit board technology. This highly advanced technology was developed specifically for the electronics industry and has not been adapted to electrochemical flow cells so far. However, it has several unique properties, making it a potential platform that offers unique features for an electrochemical flow cell. PCB technology offers the possibility to integrate electrochemical electrodes, sensors and controller units on a single substrate to make a novel cell with unprecedented properties. This saves production time and costs.

Abdullah Khan Gul is working on designing small, inexpensive, low-power sensors that can measure several quantities needed for electrochemical development. These can include temperature, flow, pressure, moisture, and other parameters. The effort will involve advanced thin-layer technologies and best practices in manufacturing, material, and chemical engineering. The integrated sensor development will be based on a physical principle that meets specified parameters. It avoids cross-sensitivity to environmental conditions.

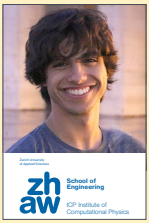


Axel Dullak studies the fluid flow, mass transfer, and chemical reactions within the porous electrodes of electrochemical flow cells. To achieve this, he uses simulations with the Lattice Boltzmann method. By understanding the role of the pre structure, efficiencies and yields can be improved. This will help to develop electrochemical cells that are not only more effective but also more sustainable. This supports greener and more efficient chemical production processes.

Pedro Arias Villarroel´s work focuses on the design and rapid prototyping of cutting-edge electrochemical cells. He is involved in a range of activities, from discovering novel materials and electrocatalysts to developing new cell designs. His goal is to either optimize the functionality of these cells or to deepen our understanding of their operations. By exploring innovative materials and crafting advanced designs, he aims to contribute to the future of electrochemical technology. This will make processes more efficient and sustainable.

MiEI

Doctoral network for microprocess engineering for electrosynthesis



Lourenço Côrte Vieira is involved in the mathematical modelling and simulation branch of electro-organic synthesis. His primary research is on describing electrochemical phenomena at the continuum scale via partial differential equations. The main goal is to determine the distributions of concentration, pressure, current density, and potential throughout the entire cell area for various processes. This will enable a greater understanding of how operating conditions at this level affect the selectivity and yield of the desired products. It is then through the state of the art modelling that we will unlock optimized flow cell designs for greater efficiency.