Process 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 three doctoral candidates is working on the development of new electrochemical production processes for the fine chemical and pharmaceutical industry.

www.project-miel.eu

Contact

Dr. Robin Kunkel | coordinator
Phone: +49 721 4640 504
robin.kunkel@ict.fraunhofer.de

Carolyn Fisher
Phone: +49 721 4640 277
carolyn.fisher@ict.fraunhofer.de

Fraunhofer Institute for Chemical Technology ICT
Joseph-von-Fraunhofer-Straße 7
76327 Pfinztal (Germany)

Social media

Follow MiEl on LinkedIn | MiEl Network

Follow MiEl on X | Project MiEl

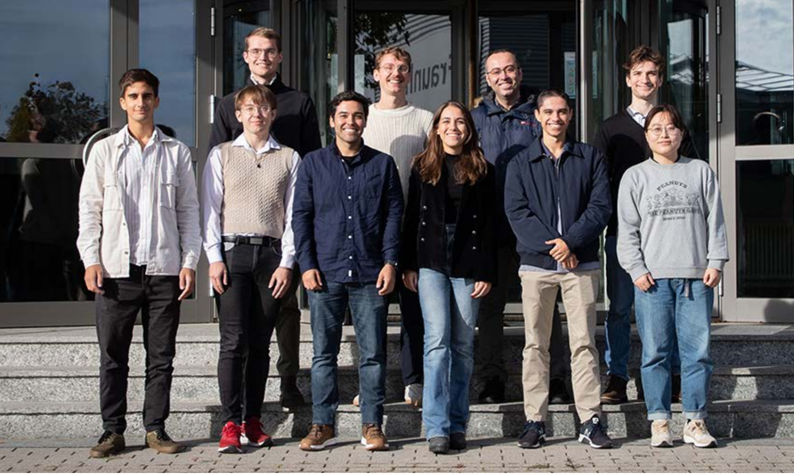
Publications

Follow MiEl on zenodo

Funding

Funded by the European Union (Grant Agreement no. 101073003). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

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 process development

Innoverda

Samuele Marinari aims to develop a one-step synthesis of a key antibiotic replacing the current route that uses hazardous reagents and conditions. He proposes electrooxidation as a more sustainable and cost-efficient alternative. By screening different electrode materials, solvents and supporting electrolytes the best conditions for reaching high selectivity and enery efficiency will be selected for this challenging transformation. Once optimized, the process will be transferred from batch to a flow reactor to enable scalibility.

Gonzalo Araya Vargas is working on the development of an automated optimization platform for (electro-)syntheses in microflow reactors. In chemical synthesis optimization is a very labor-intensive and time-consuming process. In his work Gonzalo aims to optimize reaction conditions in a more intelligent and efficient manner. For this purpose, he uses algorithms such as Bayesian models, and real-time analytics, such as spectroscopic tools, to create an autonomous optimization platform. This approach can significantly reduce the need for extensive trial-and-error experimentation, speeding up process development while promoting sustainable practices in chemical synthesis. Gonzalo's goal is to create a smarter, faster, and greener way to optimize electrochemical reactions.

Fraunhofer ICT

MiEI

Doctoral network for microprocess engineering for electrosynthesis

DTU

Tuse Asrav is developing a simulation-based framework to integrate resource efficient electrosynthesis into industrial production. The platform couples process modeling with stochastic optimization, Monte Carlo uncertainty quantification and global sensitivity analysis to evaluate and optimize continuous electrochemical processes. Uncertainty analysis measures how process and market variability affect economic and environmental outcomes, while sensitivity analysis identifies the key drivers of performance, cost, and scalability. By comparing design alternatives and scale up strategies, the framework supports robust decisions under uncertainty. The goal is a generic methodology that accelerates early-stage development and industrial adoption of sustainable electrosynthesis, uniting techno economic assessment, optimization, and uncertainty aware analysis.