

## Research Internship (15 ECTS)

### Topic: Optimization of an artificial hydrolysate using the design of experiments (DoE)

Hydrolysis can make renewable raw materials such as agricultural residues accessible to microorganisms. However, in addition to the sugars released during hydrolysis, other substances are also formed that can significantly influence microbial growth. Moreover, hydrolysates differ from batch to batch, as the composition of the underlying raw material is subject to natural variations. Modern process control strategies must be able to react to such batch dependencies, so that the development of tolerant fermentation processes for the production of platform chemicals from renewable raw materials can be further advanced.

#### Aim of the research internship

The aim of the research internship is the optimization of an artificial hydrolysate using the design of experiments (DoE). First, an extensive literature research will be conducted to identify microbial growth-inhibiting as well as -promoting compounds in conventional second-generation (2G) hydrolysates. After evaluating the literature research results, the most influencing compounds will be experimentally assessed. For this, the new findings will be combined with the knowledge of the existing, chemically defined “artificial hydrolysate 1.0” using the DoE approach. To compare the performance of the generated design options, the artificial hydrolysate formulas will be applied as cultivation media in *C. glutamicum* and *S. cerevisiae* fermentations (BioLector flower plate, Erlenmeyer flask). Finally, the optimized artificial hydrolysate will serve as a chemically defined, batch-independent standard for the comparison of 2G hydrolysates derived from real raw materials.

#### Requirements

- Independent planning of experiments
- Proactive way of working
- Advanced laboratory skills
- Basic fermentation skills
- Basic analytic skills (e.g., HPLC)
- Team player

#### First steps

- Literature research
- Introduction to DoE software
- Introduction to lab work
- Order of necessary chemicals and devices (if not available yet)
- Preparation of a detailed timetable (e.g., as a Gantt chart) for the progress of the research internship (what?, when?, how long?)

#### Application

Please send your application documents (including CV) to the supervisor of this project: M. Sc. Nico Geisler ([nico.geisler@tum.de](mailto:nico.geisler@tum.de)). He will be happy to answer any further questions you may have.

Start of the project: February 2024