TUG

Paid Master Thesis

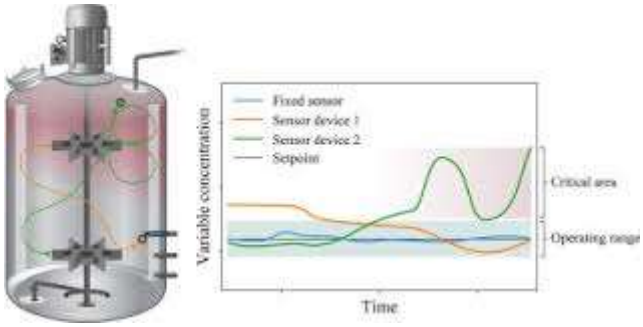
process & particle engineering

Modeling the pH Distribution in a Cell-Culture Bio-Reactor

Background

The Institute of Process and Particle Engineering together with the spin-off company SimVantage successfully are developing simulation and AI tools for industrial-scale bioprocesses that are already used around the world.

We are proposing a master thesis to model the pH distribution inside a stirred tank (bio-) reactor. pH has significant impact on product quality, viable cell density and titer. The project includes the modelling of the buffer systems inside the fermentation broth or cell culture media. The fluid flow field and the distribution of substance inside the reactor is already available in the software. The task of your master thesis is to calculate the pH value based in the concentrations in every part of the reactor.



Your work will have major impact on the capabilities of current simulation tools and will be implemented in industrial projects.

Tasks

- Literature Review: Understand buffer systems and existing pH modeling approaches.
- Model Development: Develop a mathematical model to calculate pH based on buffer equilibria and concentration fields.
- Implementation: Integrate the pH model into existing simulation software with predefined flow and concentration data.
- Validation: Verify the model using test cases and, if possible, compare with experimental or literature data.
- Documentation: Summarize methods, results, and insights in a written thesis and final presentation.

Expected Results

- A computational model that accurately predicts pH distributions in a stirred tank reactor based on known concentration fields and buffering systems.
- An implemented module integrated into the existing simulation framework.
- Validation results showing the plausibility and numerical correctness of the pH distribution under various conditions.
- A well-structured thesis document with scientific depth and practical relevance to bioprocess simulation

Start: ANYTIME

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